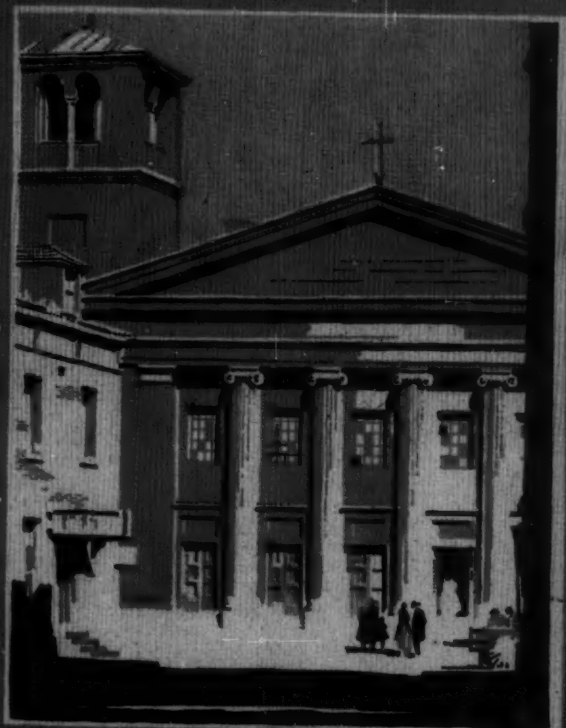
THE ARCHITECTURAL FORUM



MARCH
1924

QVALITY LEAVES ITS IMPRINT

Standard Elevator Door Hardware *for the* Standard Oil Building

R-W IDEAL Elevator Door Hardware Is the Recognized Standard

The Standard Oil Company's new office building in New York City stands as a monument to the wisdom of standardization. Standardized business methods, combined with the use of standardized equipment have been largely responsible for this company's success. Hence it's not surprising that R-W IDEAL Elevator Door Hardware—the standard of America—was selected for use in its building.

Positive safety, assured silence of operation and the ability to withstand gruelling service have made R-W IDEAL Elevator Door Hardware the choice of the country's foremost architects. The complete line includes automatic door controllers and checks, and hangers for single-speed, two-speed and three-speed doors; for doors in pairs, operating from both sides, and for combination swing out doors.

Also exclusive manufacturers of Slidetite Garage Door Hardware, AiR-Way Multifold Window Hardware and other nationally-advertised items of builders' hardware.

Write today for our time-saving detail folio, from which actual blueprints of elevator door installations can quickly and easily be made, as well as for Catalog F-21.

New York
Boston
Philadelphia
Cleveland
Cincinnati
Indianapolis
St. Louis

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

AURORA, ILLINOIS, U.S.A.

RICHARDS-WILCOX CANADIAN CO., LTD.
Winnipeg LONDON, ONT. Montreal

Chicago
Minneapolis
Omaha
Kansas City
Los Angeles
San Francisco
Seattle

BOOK DEPARTMENT

OCCASIONALLY the strongly Spanish atmosphere which pervades Mexico draws to that fascinating land some of those who would otherwise be likely to cross the sea in quest of that charm which attaches to any old country where modern progress has not been permitted to overturn the architectural traditions and social usages of the past. Travel in Mexico amply repays the sojourner who crosses the Rio Grande, and the traveler from the United States will find there a land as foreign and unfamiliar as almost any of the countries in Europe.

Mexico might be described as a smaller Spain. Never was there a colonial possession more faithful in copying all the characteristics of the motherland than was Mexico for all the long period during which it was subject to Spain, and the vast wealth of the colony fully warranted the full and rich development which it received at the hands of the architects, engineers and miners who came in the van of the Spanish conquerors. So great was the amount of their building and so numerous the projects of their engineering that much still remains even after many years during which Mexico has been the prey of rival political factions and the scene of countless revolutions.

The architecture of Mexico like that of Spain itself is very largely that of the Renaissance influenced by a strong tinge of Moorish, but in Mexico the mixture is further complicated by the inclusion of much which is neither of the Renaissance nor of the Moors but of the early Indian inhabitants. The result is an architecture of considerable freshness and charm, a little heavy at times, particularly in large masses, but with a heaviness which often appears to be really solidity and dignity, and often redeemed by a delightful naïvetê.

Then too, the charm of the strongly Spanish and virile architecture is aided by much in the way of accessories. From afar the traveler will observe the domes of the great church which even a good sized village will possess, a dome probably covered with tiles of blue, red, green, purple and gold, all these colors appearing over the adobe walls and cluttering roofs of the village and all dazzlingly brilliant in the blazing sun. And the tiled dome will be found to be merely the external, visible expression of the zeal with which the minor arts entered into the service of architecture and exemplified in the work of the woodcarver, the iron forger, the metal worker, the painter and the sculptor whose craftsmanship does so much to render Mexican churches impressive. Nor has architecture been developed solely in the service of religion, for in any Mexican city there will be found massive and solid old public buildings, often exhibiting the scars of revolution but still in use, and one of the delights which dwell in the memory of travelers in Mexico is the freshness and beauty of the courtyard or patio about which, in true Spanish fashion, the dwelling house is generally built. From the narrow cobbled stone street the house may present the blankness and uncompromising aloofness of stone or stucco walls, but when once the street door has been opened the visitor enters another world, for the patio is found to be a green and fresh oasis, surrounded doubtless by deep shaded loggias and made beautiful by its tiled walls and floors, its fountains, orange and lemon trees, and its wrought iron grilles over windows, while to accompany all this Spanish architecture there is in the people themselves that grave courtesy or punctilious politeness which is as truly Spanish as the surroundings themselves.

"Successful Compositions Can Be Made by Contrasting Lines or Treatments of Surfaces"
Illustration from "An Architectural Pilgrimage in Mexico"

It is always a pleasure to come to a work on travels written and illustrated by an architect. His careful training in making the most of possibilities leads to his selecting the best for description and illustration, and he chooses what composes well into a picture and then arranges the details of the focus to secure the utmost in the way of results. This is what Mr. Bossom has done in this excellent work on Mexican architecture. With an architect's instinct for selecting what possesses architectural merit as well as pictorial value he has photographed or sketched buildings of widely different types,—churches, convents and cathedrals along with public buildings of various sorts, and many types of residence structures in town or country.

AN ARCHITECTURAL PILGRIMAGE IN MEXICO. By Alfred C. Bossom. 109 Half-tone Plates; 10½ x 13½ ins. Bound in Buckram. Price $20. Charles Scribner's Sons, New York.

Any book reviewed may be obtained at published price from THE ARCHITECTURAL FORUM

TOWNS AND TOWN PLANNING, ANCIENT AND MODERN. By T. H. Hughes and E. A. C. Lamborn, 156 pp., 7½ x 10 inches. Price $5. The Clarendon Press, Oxford.

MUCH is being written on the subject of town planning, and during the past two decades enough has been actually accomplished in America or Europe to prove the value from any point of view of having a definite plan upon which a town or village may develop. Many of those who are most interested in the planning of towns and cities possibly regard the subject as something of modern invention, devised in view of the immense growth of modern cities and towns, and intended to minimize if not prevent the inconvenience and congestion which so hamper cities today.

In this interesting work the authors cover the subject of town planning in ancient as well as in modern times. Egypt provides the earliest example of a town plan, that is of a pre-designed pattern formed by organized groups of buildings unified by thoroughfares, in the small town of Kahun, laid out in regular blocks to house workers on one of the pyramids more than 2,500 years before the Christian era. The beauty of Athens, like that of mediæval Durham, depended not so much upon harmony in the ordered grouping of a unified scheme as upon the skillful use made of a fine site to plan and erect a beautiful group of structures in a commanding position which, in the case of Athens, meant a long and stately street climbing a terraced hillside. All of the *coloniæ* built by the practical Romans were built upon a definite plan which made use of two main streets crossing at the center and thus dividing the town into four quarters, each of which was subdivided into rectangular blocks (*insulæ*) by means of smaller streets parallel and at right angles to the principal thoroughfares. In one of the angles formed by the intersection of the principal streets was usually placed the forum where the business of the town was transacted. An excellent example of such planning of an old Roman town may be seen at Silchester, in England, laid out as a *colonia* in the first century. But the chief bequest of Rome to civic planning was not a particular type of town arrangement but an example of creating municipal dignity—of using resources in a large way, remembering that a small town in Britain was a unit in the Roman Empire and that since it shared in its dignity, its appearance must be such as to be worthy of its citizens.

The great humanist movement of the fourteenth and fifteenth centuries in Italy and the attending revival in culture had a far-reaching effect on town planning. Italy awoke to the splendor of her architectural heritage and began to emulate it, and along with the revival of classical architecture there came the use of the old imperial qualities of scientific organization, of largeness of scale of the grand manner of planning which reflected the rebirth of the Roman spirit, while at the same time a new beauty was added to civic art by the application of formal design to garden planning. So in France, where as early as 1545 Vitrey-le-Francois was founded by Francis I on a regular plan inspired by Italian models, having in the center a *place d'armes* from which radiated the four principal streets. Interest in France was still further stimulated by Louis XIV, who regarded planning and architecture as the surest means of impressing his own and future ages with a sense of his greatness. Not only did he induce the Italian Bernini to come to France, but he encouraged the vast scale adopted by Le Notre in the designs for his gardens, the plans of which have had considerable influence on later times. In Paris and other French cities large squares and open spaces become important features in plans for rebuilding; such are the Place des Victoires and the Place Vendome. Again in England, where the most famous plan was Wren's for rebuilding London after the great fire, to which might be added the work of the Woods at Bath.

In a work as complete and comprehensive as this volume it is scarcely to be supposed that American work would be overlooked, and due recognition is given to L'Enfant's plans for Washington and to William Penn's for Philadelphia; due mention is also made of plans formed for the improvement of cities already existing, such as Baron Haussmann's for Paris, and Burnham's for Chicago, and particularly satisfactory treatment is given to much comparatively recent work, such as that at Port Sunlight, Bournville and Letchworth, or as that which was begun in America in 1869 at Garden City. The authors also notice the plans for projected work.

There are not many books upon this topic which cover thoroughly a very large subject in so small a space. Presenting as it does a review of the entire range of town planning, from prehistoric times to the immediate present, it possesses a value which should procure it a place in the library of anyone interested in the subject.

STRESSES IN FRAMED STRUCTURES. Editors in Chief: George A. Hool and W. S. Kinne, assisted by a staff of eight specialists. 620 pp., 6 x 9 ins. Price $5. McGraw-Hill Book Co., Inc., New York.

THIS volume is the fourth of a series of six which deal with various phases of engineering, the previous volumes being entitled "Foundations, Abutments and Footings," "Structural Members and Connections," and "Movable and Long-span Bridges." All these works have abundantly proved their value to engineers and to architects whose practice includes the designing of structures in which these details are important.

As with the earlier volumes of which Messrs. Hool and Kinne have been the editors-in-chief, this work covers thoroughly and completely the subject which it considers. While it is not intended to be used as an elementary text-book, its usefulness to students lies largely in its exact definitions and the clearness and conciseness of the text, helped considerably by carefully drawn figures and diagrams. A study of stresses in framed structures logically involves study of loads and statics, reactions, moments and all the other details of which a thorough understanding is so necessary.

The editors-in-chief are of course well known by reason of their extensive experience and the number of excellent works they have prepared. Associated with them in the preparation of this volume are: Charles A. Ellis, Vice-president of the Strauss Bascule Bridge Co., Chicago; Robins Fleming, Structural Engineer, American Bridge Co., New York; S. G. Roeblad, of Clifford & Roeblad, Consulting Engineers, Boston; H. S. Rogers, Professor of Irrigation Engineering, Oregon State Agricultural College; C. A. Willson, Engineer for State Architect of Wisconsin, and Wilbur M. Wilson, Research Professor of Structural Engineering, University of Illinois, each a specialist in his field.

DECORATIVE FURNITURE. By George Leland Hunter. 480 pp., 9 x 12 ins. More than 900 illustrations; 23 plates in color. Price $25 net. J. B. Lippincott Company, Philadelphia.

THE study of architecture, and particularly of interior architecture, is so inseparably bound up with the study of decoration and furniture that the study of one involves necessarily the study of the others. It would seem that as soon as men began to build permanent habitations it was found that there existed a direct and logical connection between the designing of a structure and the designing of its furnishings. No more striking illustration of the truth of this statement could be desired than has been supplied during the past few months in Egypt where the discovery and excavation of royal tombs have brought to light interiors which have been hidden for several millenniums,—interiors wherein furnishings and accessories are in complete agreement with the architecture of these abodes of the royal dead.

During all of the modern architectural periods, from the time of the Renaissance on, architects were quite as much concerned with the designing of furniture and accessories as with the detailing of their structures. The work of many of the great French architects relies for its excellence almost as much upon the skill with which their furnishings were handled as upon the designs of the buildings themselves, and English architects and master builders gave to the designing of the most trifling details of furnishing time and effort which would today be regarded as out of all proportion to the part such accessories played. All these men realized that even the most faultlessly designed interior is but a cold and lifeless shell when emptied of the objects which render it suitable for use as a human habitation and which at the same time aid in the interpretation of the structure's design. Not without good cause are so many present-day architects interesting themselves in the important topics of decoration and furnishing.

Mr. Hunter's study and research in a number of closely related fields have already produced a number of volumes which add to the sum of knowledge possessed today upon subjects closely related to architecture. His works "Decorative Textiles" and "Italian Furniture and Interiors" have aided in the education of many students of architecture and the kindred arts. In the present volume he undertakes a review of the history of furniture, and dividing the topic into the various periods or epochs into which it logically falls, he discusses each, considering the form which its furniture took, the materials of which it was made, and the ornament or decoration which aided in adapting it to use.

THE BRIC-A-BRAC COLLECTOR. By H. W. Lewer and Maciver Percival. 256 pp., 5 x 7½ ins. Fully illustrated with half-tone cuts. Price $3. Dodd, Mead & Co., New York.

WITH interior decoration assuming an increasing importance in connection with the practice of many architects it is not difficult to realize that antiques sustain a certain relation to architecture.

This interesting volume, the latest of "The Collector's Series," includes chapters of considerable extent upon forms of antiques which enter into decoration, such as lacquered ware in various forms and needlework of different kinds which is useful in screens and for furniture covering. Study of the times of which these and many other objects dealt with here are a part is an aid in arranging interiors in the different periods.

THE EDITOR'S FORUM

THE NEED OF APPRENTICES

THE recruiting of the building trades is of course dependent upon securing apprentices, and apropos of this difficulty are parts of a letter from Franklin D. Roosevelt read at a session of the recent convention of the National Society for Vocational Education:

"One of the greatest problems in American industry today is the lack of young men to fill the ranks of certain trades and the surplus of workers in the so-called white collar occupations.

"Three things must be done to solve the problem. First, we must find in what building trades shortage of man power really exists. Having found where young men are needed, there must be determined what sort of schooling or training is needed to turn out graduates fitted to become apprentices; young men who will be welcomed into the ranks of skilled labor. I hope there will be established such practical standards as will make any young man so trained eagerly sought.

"The third problem, once the others are solved, is to assure steady employment to graduates of these courses.

"What we need is more appreciation of the dignity of craftsmanship, the true guild spirit of the middle ages, which made the workmanship of that day something to be studied and admired by the generations which followed."

STANDARDIZATION OF PLASTER

THE National Line Association, in following for the use of plaster the tendency toward simplification and standardization which for some time has been evident in other fields, has issued its "Standard Specifications for Lime Plaster" as its Bulletin 305 A. The bulletin is a model of what such a publication should be, and after defining the quality of materials and stating just what is to be regarded as adequate application and workmanship, the actual specifications for plaster of different kinds are presented in such form that they may be quoted directly and included in an architect's complete building specification, or if desired the short form may be used and the contractor referred to the standard specifications. Each of the specifications is on a separate page, and the arrangement is simple and logical.

This bulletin, which is the result of several years' study of field conditions, and which was prepared in conjunction with a number of architects, and engineers as well as expert plasterers, may be had from any office of the National Lime Association.

YARD LUMBER GRADING

THAT lumber cut from different species of trees but used for the same purposes should be dressed to different sizes and graded under specifications entirely different has long been recognized by lumbermen as a condition that reacts to the disadvantage of everyone connected with the production, sale, or use of lumber. It was this knowledge which induced the lumber industry to take up the question of standardization several years ago, and which led to a study of the problem by the Forest Products Laboratory, resulting in the recent publication of Department of Agriculture Circular No. 295, "Standard Grading Specifications for Yard Lumber, as Recommended by the Department of Agriculture."

The Forest Products Laboratory has endeavored to put forth in this circular a clear picture of present practice in yard lumber grading and to present a set of standard specifications which may serve as a guide for the lumber producing, distributing, and consuming interests in their efforts toward the creation of American lumber standards. Part I contains a discussion of the principles upon which standard specifications are developed. Chief among these are the basis for standard grading rules, the principles considered in establishing standard sizes, and the method of establishing a standard nomenclature. Part II contains the basic grading rules, standard specifications and suggested shipping instructions, definitions of defects and blemishes, and the proposed standard nomenclature.

Under the discussion of "The Basis for Grade Standards," "basic grading rules" and "standard specifications" are first defined. "Basic grading rules" are described as those which harmonize into grades of equal quality lumber manufactured in various regions from the same or different species of woods used for the same general purposes.

In presenting these specifications, the Department adheres to established principles in lumber grade specifications, but follows them to their ultimate conclusion. The Forest Products Laboratory recognized early in its study that underlying present commercial grades was an expression of the collective judgment of manufacturers, distributors, and consumers of lumber, and that therefore the problem of producing standard grading rules was not one of formulating specifications altogether new, but rather a work of harmonizing existing grading rules into a grading specification which should be definite and concise, yet sufficiently elastic to permit the use of judgment on the part of the grader concerned.

HENRY BACON

1866 - 1924

The ARCHITECTURAL FORUM

VOLUME XL MARCH 1924 NUMBER 3

√. Henry Bacon

By ROYAL CORTISSOZ

IT is impossible for me to think of Henry Bacon without thinking of the time and place of our earliest contacts. We were young together in the office of McKim, Mead and White, when that firm was doing crucial things in the revival of American architecture. I remember always, as though it were yesterday, the enkindling atmosphere created by those men and by their remarkable coadjutor, Joseph M. Wells. It had much to do with the development of a definite style, the style of Bramante and the Italian Renaissance. It had even more to do with the development of good taste and the conception of architecture as an art. Bacon was one of the men enlisted heart and soul on the side of these constructive principles.

He was so enlisted because good taste was born in him. Looking back over the thirty-odd years of our friendship I remember nothing about him more characteristic than a certain sense of measure and balance in everything that he said or did. He initiated me into the mysteries of golf, and we had countless long talks together. If they were about people, they were sympathetic and just on his part. There was nothing weak about him. You would know, somehow, when Bacon disapproved. But I never heard him say an unkind or cynical thing about anybody. On the other hand, in matters of art, there could never be the smallest doubt that he was on the side of the angels. He hated architecture that was flamboyant or slovenly, that sacrificed structural essentials to decorative flourishes.

Is there any art in which straight thinking is of more importance than it is in architecture? I put these everyday human things in the foreground, these upright and square ways of Bacon as a man, because they have so fruitful a relation to his work as an artist. Fate gave a far more diversified range to his labors than is generally realized. The Lincoln Memorial looms so grandly in his career, the climax to all that he did, that his large resourcefulness is sometimes forgotten. But with that clear, firm intellectual power of his he tackled an extraordinary number of problems. He could take the housing of a bank or a library in his stride; he knew how to design a schoolhouse or a hospital. He could even build an astronomical observatory. Yet it is not difficult to understand how at the time of his death the world was inclined to honor him just as the architect of the great temple at Washington.

Its Greek beauty carries you back to the Parthenon, but it carries you back also to the man I have endeavored to indicate at the outset, dedicated in his youth to a high ideal. The antique idiom was part of his nature, an inevitable means of expression for the traits which enriched his personality. It connotes his rectitude and his serenity, his cool judgment, his instinctive gravitation to what was pure and majestic. He saw things grandly, monumentally, and it was, again, one of the generosities of fate that brought him numberless monumental problems before he was confronted by the greatest of them all. Saint-Gaudens, French and other sculptors used to go to him for the pedestals of their statues. He made them more than pedestals. He truly collaborated with his sculptor friends and achieved the unity of design which amounted to half their battle.

There lies the point of fusion between Bacon's character and his art, in the secret of unity. With his straight thinking and his steadfast vision he could conceive of a building as a whole, vitalize mass, and use the heroic scale in such wise as to achieve not only dignity but charm. If the Lincoln Memorial is a mighty structure it is also enchantingly beautiful. There is an almost abstract sublimity about its glorious lines, yet it is one of the most personal achievements in modern architecture. Glance over the field, consider scores of the public buildings in this country designed in the classical form. They include some beautiful edifices, but despite their beauty you would characterize them as academic. There is no trace of an academic point of view in the Lincoln Memorial. It is a work of living, individualized art. Survey all of Bacon's buildings, early and late, the whole accomplishment of a rich career, and you will find in them testimony to the organic life in his genius as an artist.

THE LINCOLN MEMORIAL, WASHINGTON
HENRY BACON, ARCHITECT

Photo, Kenneth Clark

"Arlington House"

By GILBERT L. RODIER

AT the close of a day in May in the year 1864, (so it is related), President Lincoln and General Meigs stood under the massive portico of Arlington House, and gazed at the splendid panorama of wooded hills, river, and distant city that lay below them, and, enraptured as millions have since been by the wondrous setting of the old mansion, spoke of its owner and of the possibility of his return after the end of the war.

Meigs had been the friend of General Lee for many years and had, indeed, sympathized with the love of his native state which prompted the Confederate leader to sever his connections with the Army of the United States, to fight for the place of his birth. But over three years of cruel war had embittered him against the Southerner, and he now seized this opportunity to broach to the President a project which he had long considered, and one which would forever prevent Lee from returning to what had been his home for 30 years. Arlington had been a great military hospital, where had died thousands of Union soldiers; their remains had been buried at Soldiers' Home in the District of Columbia, at Alexandria, and in several other cemeteries near Washington, but none in Arlington. Now there was no space available except by the establishment of a new cemetery, and Meigs, then Quartermaster-general of the Army, had conceived the idea of a great National Cemetery on the estate of the Southern General. It is said that Lincoln thought long before replying to the General, and was persuaded to give his approval only when told that there were, even then, many bodies awaiting burial, and for which there was little or no room in the overcrowded burial grounds belonging to the Government in Washington. Burials were made at Arlington the following day, fulfilling as a sort of grim jest, the unintentional prophecy of Lee's daughter, who wrote to a friend in Georgia in reply to the latter's query of "Would they make of Virginia a burying ground?" the answer "Yes, but for themselves."*

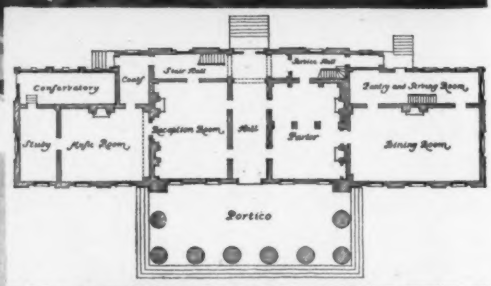
The house is built of brick (I am sorry to say that these bricks were not imported from England "in ballast," but were made on the site), and the exterior is stuccoed with lime mortar. There are lines in the stucco to represent stone courses, and the jointing is well studied. The columns are also of brick, stuccoed and painted white, but the balance of the exterior, except window detail and cornices, is painted in a warm buff or ochre color. The present roof is of slate, but this is modern, as the covering was originally of wood shingles. Modern also is the metal guttering and spouting which successfully hides the crown members of the cornices, but which serves the purpose of protecting the walls.

Most familiar to the casual visitor is the great portico with its six huge columns and its heavy pediment, so like many of the early Greek temples in impression, and yet totally unlike any in detail. The wings are screened by enormous magnolias, so that the portico alone, standing a full 200 feet above the Potomac, and framed in the green of great trees, is the picture seen from Washington across the river, and this is destined to become the focal point of the axis for the Memorial Bridge leading from the Lincoln Memorial to Arlington. However, the most pleasing view of the building, and yet the least known, is that of the north wing as seen from the old garden at the side of the greenhouse. Charming also is the court formed between the west side of the house, the slave building and the old outdoor kitchen, though the great expanse of glittering concrete paving the court, which is modern, is most unpleasing and should be removed in favor of more restful lawn and simple pathways.

As to the interior design and details, the house reflects the tastes and life of its builder and owner in that it is pretentious in scale, yet simple and trite in detail—indeed, it must answer to the indictment of being "Early Victorian." In it George Washington Custis, its owner and builder, massed a wonderful collection of furniture, rugs, paintings, old books, etc., for he was a wealthy man, and his passion for possession was unlimited. There were the priceless pieces of his grandmother, Martha Washington; furnishings, china and rare portraits of George Washington, by Peale, Trumbull and Stuart; splendid works of art of all kinds, assembled during years of search and travel; in short, the place was a veritable treasure house of such things as its owner loved. To this house Custis brought his bride, Mary Lee Fitzhugh, in 1804, and amid these surroundings they reveled in dignified, splendid entertainment and simple yet stately home life for half a century.

Study of the present plan shows that there are two bedrooms on the first floor of the north wing (numbered 14 and 15), and it is known that Custis and his wife occupied these rooms after the marriage of their daughter to Robert E. Lee in 1831. But the writer is convinced, and there is every physical evidence to support the theory, that originally all of the bedrooms in the house were on the second floor, and that the space covered by rooms numbered 13, 14, 15, and the hall, Number 16, was one large dining room. All of the finish on the perimeter of this large space is exactly the same, whereas the finish occurring in the interior portions is of a totally different character. The projection in the hall (Number 16) is an old chimney breast and now serves no purpose whatever; moreover, this projection is exactly in the center of the west wall of what

*Karl Decker, "Historic Arlington."

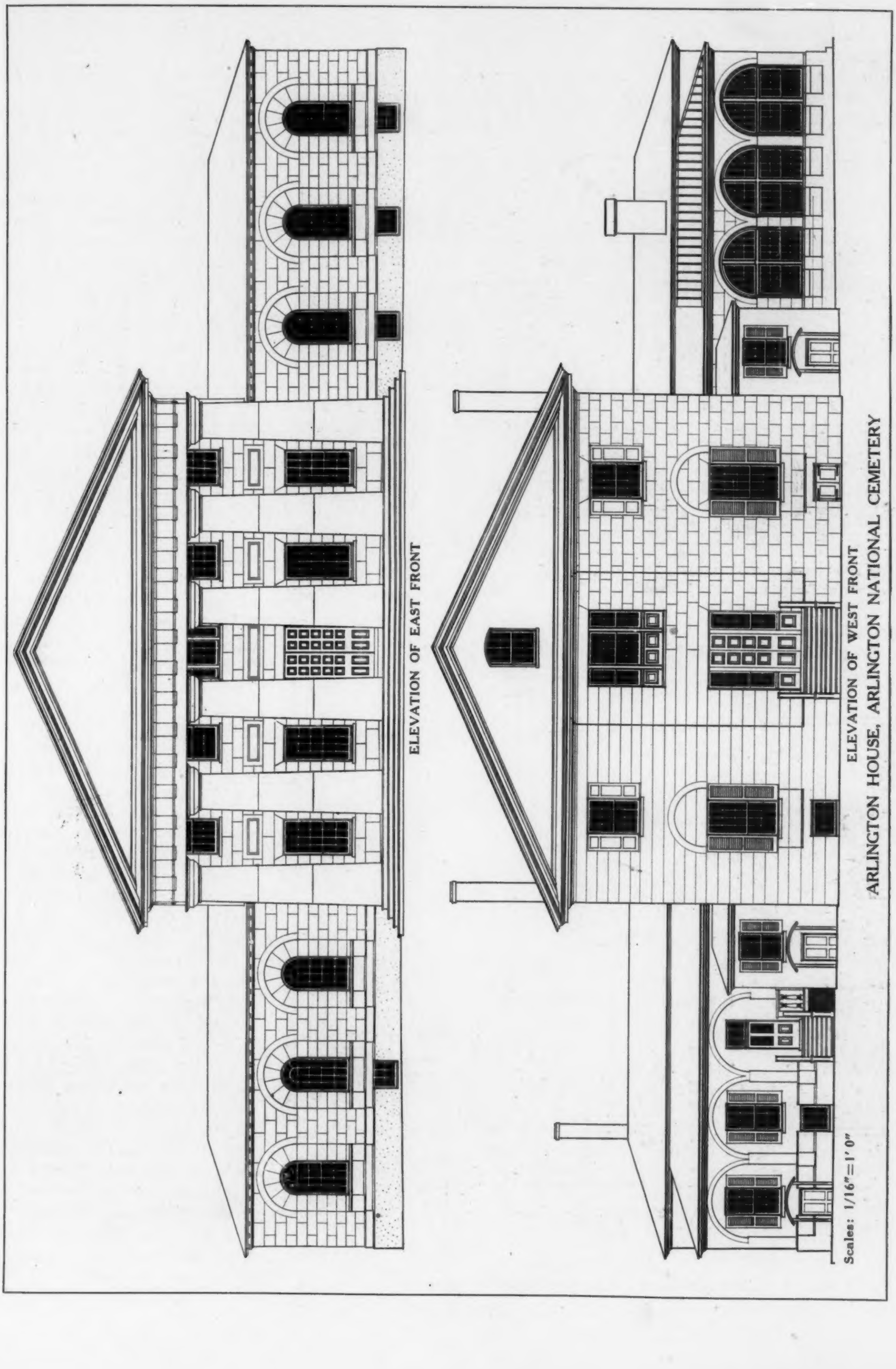


THE EAST FRONT AND RESTORED PLAN

THE WEST FRONT

Photos, National Photo.

ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY

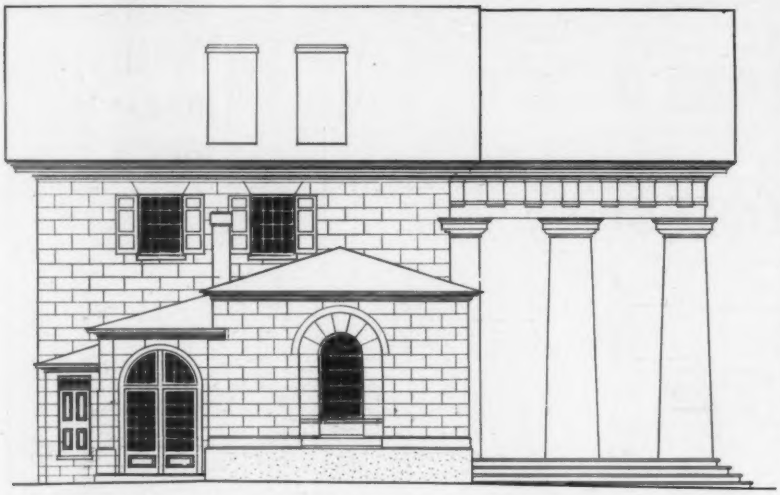


ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY

seems to have been the original dining room, and doubtless this was the fireplace. It is believed that the beautiful wooden mantel now in Number 14 was formerly used for this fireplace, it being entirely out of scale in the room where it is now placed. The relation of this space to the outdoor summer kitchen and to the basement kitchen also forms a logical basis for this theory, and on the sketch plan illustrated with the exterior views is shown what is believed to have been the original layout for the first floor. Every consideration indicates this.

In April of 1861 Lee, having returned from service with the army in Texas, where he had been during the several years of turmoil preceding the war, wrote his resignation from the United States Army, at Arlington House. On the 22nd his family fled to Richmond, and the following day he accepted the command of the Confederate Army. Within less than a week the house was occupied by a portion of the troops then feverishly building a ring of earthwork fortifications around the capital. The contents of the house were completely scattered, some pieces being taken by the Government (now in the National Museum), some finding their way into the hands of the Lee family and to Mount Vernon; but much taken by soldiers and peddled in the streets of Washington. And from that day the famous old house has been bare and empty; the entire north wing and the second floor are barred to the public, as they are occupied by employes of the cemetery. Visitors are shown through two empty, desolate rooms, the least interesting of all, historically and architecturally speaking, but only these rooms can be seen by visitors to the house.

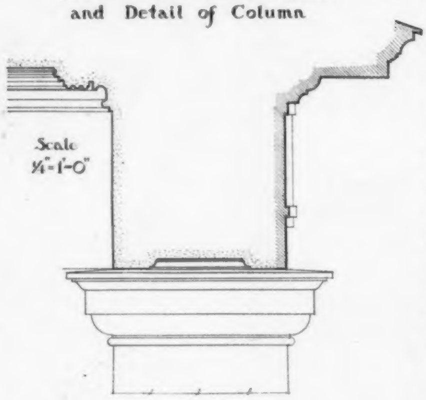
But fortunately the National Commission of Fine Arts has become interested in the old building, and it is to be hoped that the day is not far distant when it may be restored to a semblance of its original splendor, the cemetery employes moved to new and more suitable quarters, and the entire house opened to visitors so that they may carry from Arlington a true impression of what the noble old structure was like in its grand days before the Civil War.

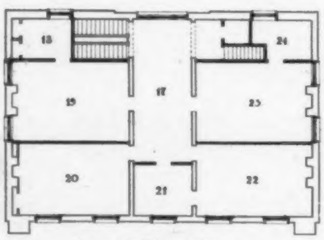


North Elevation
Scale of Elevation: 1/16"=1' 0"
Scale of Plans: 1/32"=1' 0"

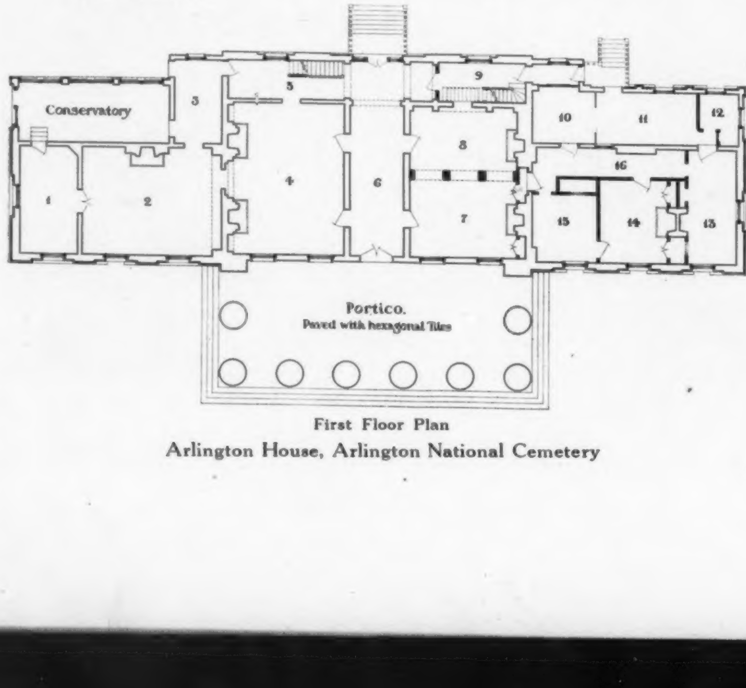
Measured Drawings by Rodier & Kundzin, Architects

Section thru Main Cornice and Detail of Column

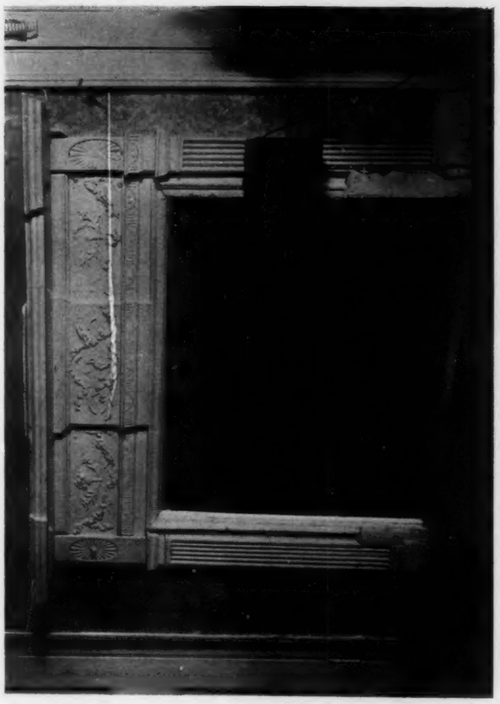




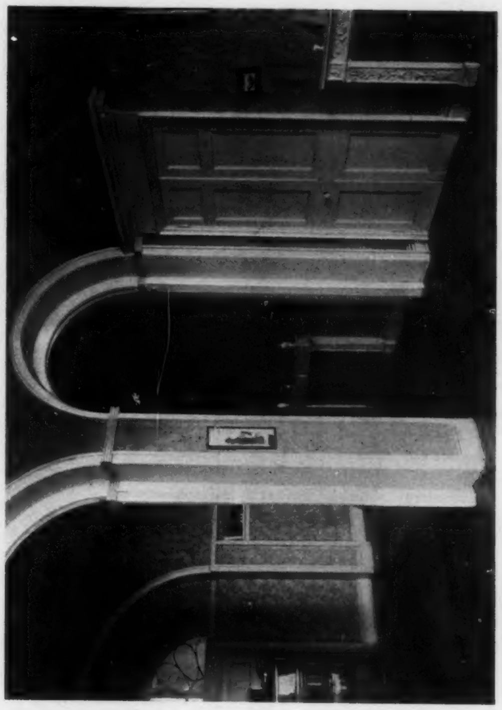
Second Floor Plan



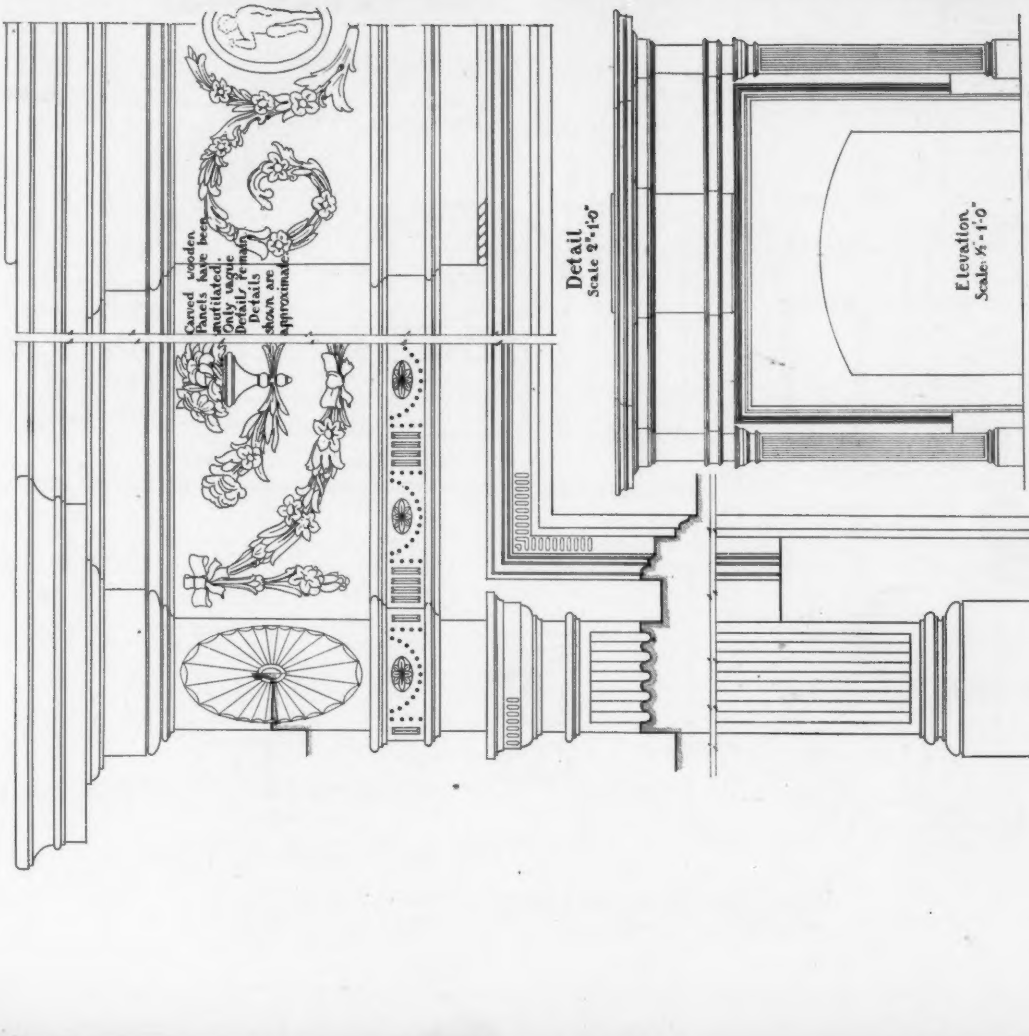
First Floor Plan
Arlington House, Arlington National Cemetery



DETAIL OF WOODEN MANTEL IN ROOM 14

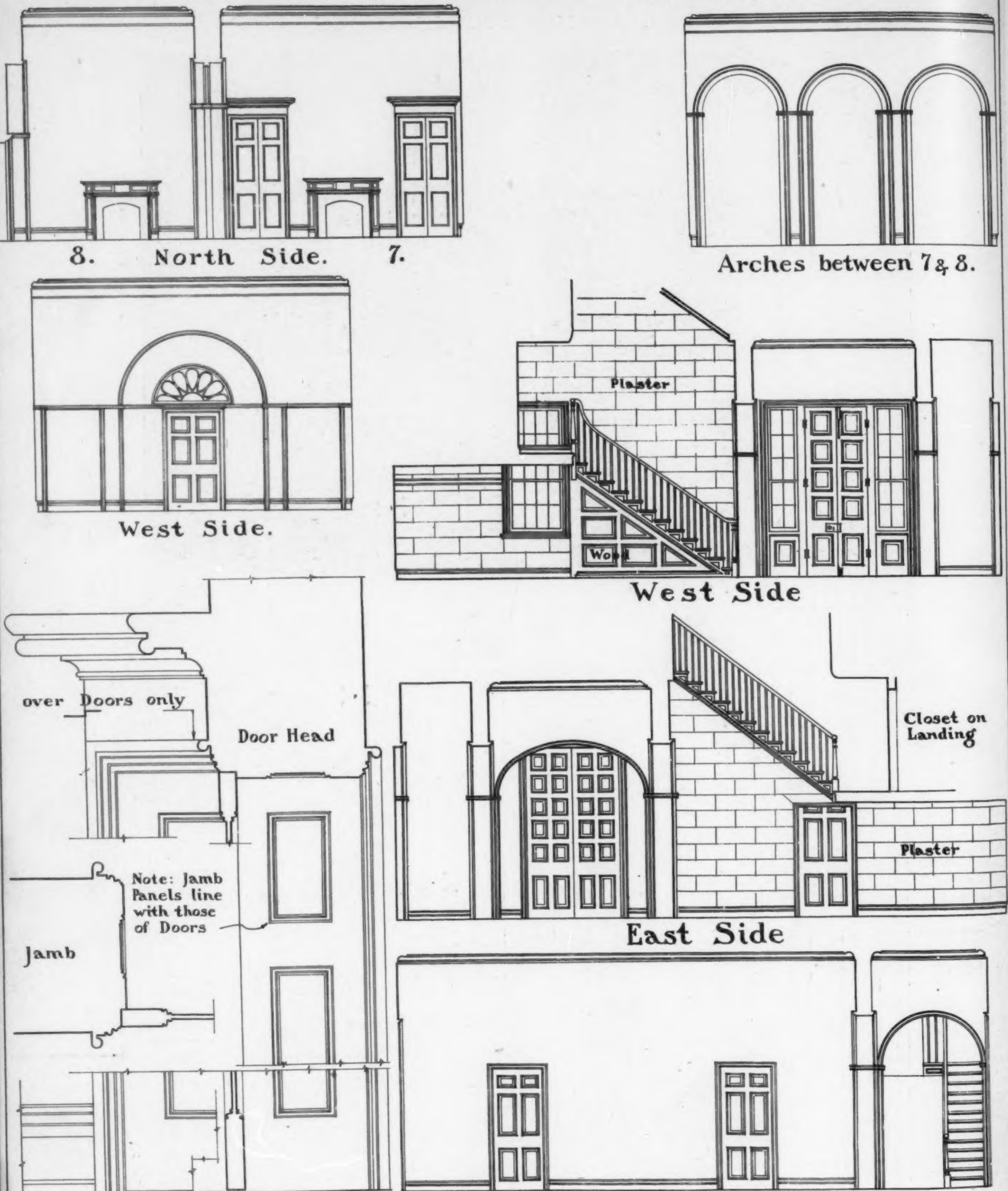


ARCHES BETWEEN ROOMS 7 AND 8



WOODEN MANTEL IN ROOM 14
ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY
MEASURED DRAWINGS BY RODIER & KUNDZIN, ARCHITECTS

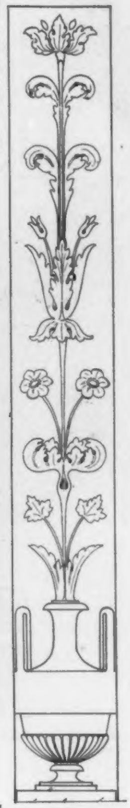
Elevations and Details of Rooms 7 & 8



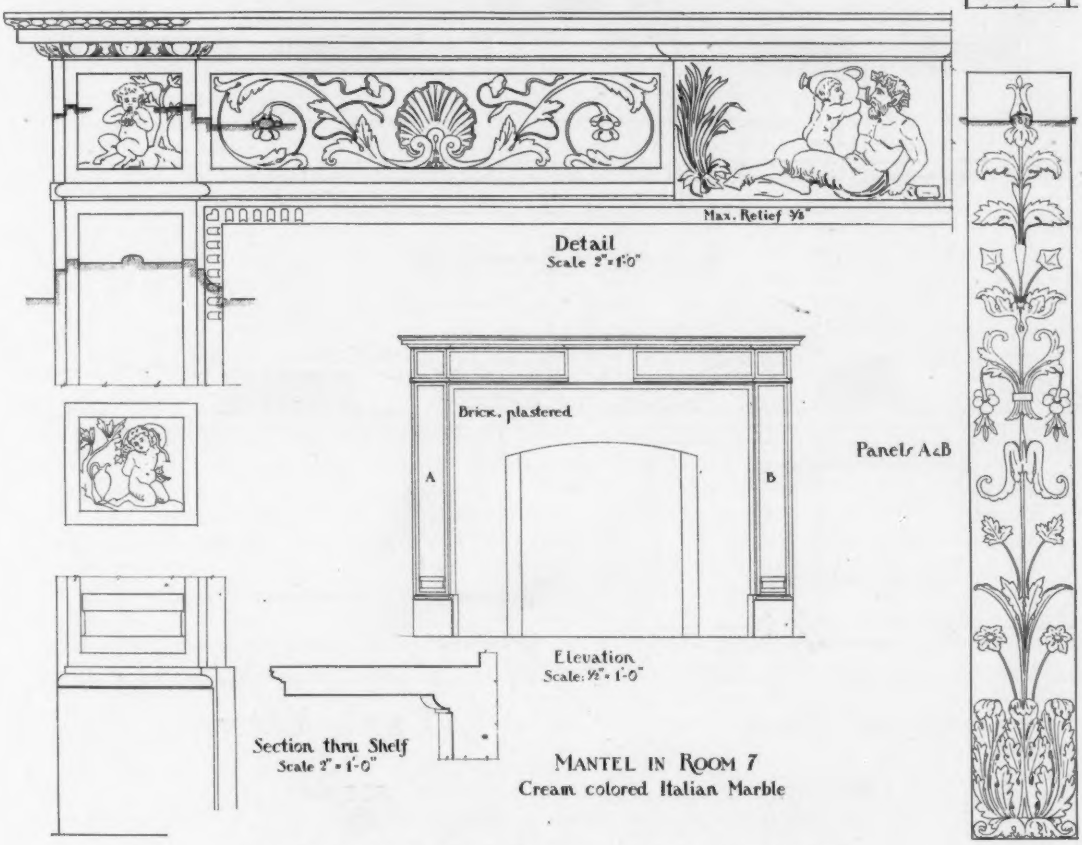
DOOR IN ROOMS 7 AND 8
Scale: 1″=1′ 0″

SOUTH SIDE
ELEVATIONS OF HALL
Scale of All Elevations: ⅛″=1′ 0″

ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY
MEASURED DRAWINGS BY RODIER & KUNDZIN, ARCHITECTS



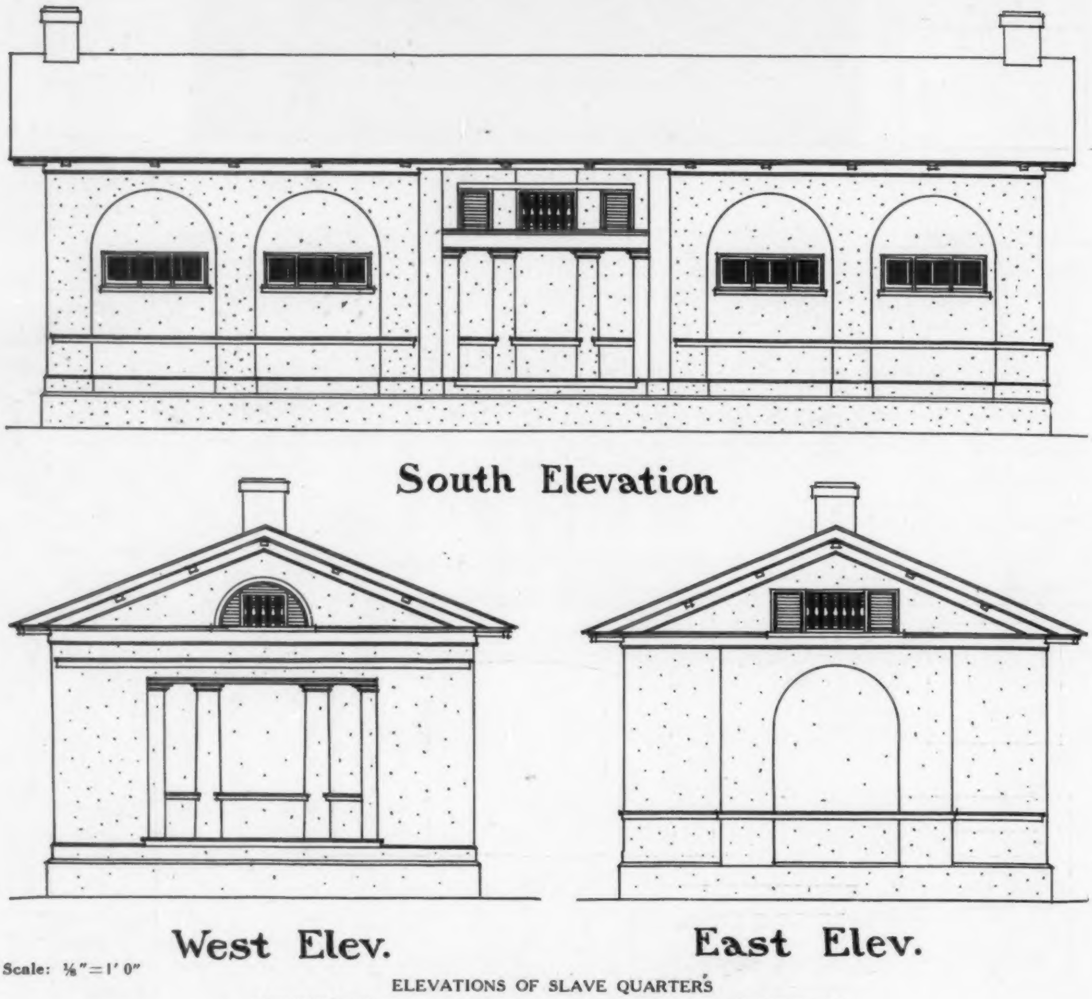
DETAILS OF MANTEL IN ROOM 8



MANTEL IN ROOM 7
Cream colored Italian Marble

ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY
MEASURED DRAWINGS BY RODIER & KUNDZIN, ARCHITECTS

COURT OF WEST FRONT, SHOWING SLAVE QUARTERS



ELEVATIONS OF SLAVE QUARTERS
ARLINGTON HOUSE, ARLINGTON NATIONAL CEMETERY
MEASURED DRAWINGS BY RODIER & KUNDZIN, ARCHITECTS

Greek Letter Fraternity House Architecture

By OSWALD C. HERING

A CURIOUS phenomenon which came to my notice some time ago possesses features of unusual interest both to the architect and to the college man who is initiated into a Greek letter fraternity. It is the almost total absence of any expression of the character and ideals of these fraternities in the architecture of their chapter houses. It would be more fitting, perhaps, and more accurate, if I limited this statement to the houses built or bought by my own fraternity, as I am naturally unacquainted with the rituals of our friendly rivals. At the same time, I may say that I have seen but few fraternity houses whose facades exhibit any distinctive characteristics, other than those which are associated with the residence or the dormitory.

Architecture invariably expresses the habits and customs of a people and the conditions under which they live. For example, an era of great physical and intellectual perfection in the human race reigned in Greece, about 400 B. C., when the art of architecture reached its highest state. Consequently, a Greek letter college fraternity, whose ideals are as lofty as current thought is capable of conceiving, may today consistently employ Greek architecture, in America, (modified to suit local conditions) in a building to be used as its chapter house and lodge. That is not to say, however, that it should be of Greek design, if it forms a unit or part of the general plan of the college, when that happens to be Tudor.

When an architect is given the job of designing a church he generally evolves something that people who enter it, or walk by it, recognize as a place for religious worship. And the same is true, or should be true, of other characteristic buildings. Why, then, has the architectural problem of the college fraternity been so generally overlooked or ignored by our architects? For, generally speaking, the best examples of architecture erected in the past 20 years are seen in America. I have not been in Paris for 12 years, but between the time I left the Ecole des Beaux Arts, in 1899, and a brief visit in 1912, I saw few new buildings that were worthy of praise. With the exception of the two exhibition buildings erected for the Exposition of 1900, the Grand and Petit Palais, and the Pont Alexandre Trois, there was nothing that had been done which could be dignified by the name of architecture. Similarly, in Rome, filled as that superb city is with the still glorious remains of an ancient art, to inspire the architect, the two newest edifices—the Palace of Justice and the Victor Emanuel Monument—may safely be ranked among the greatest architectural atrocities of the world. Where had the genius flown to, that in the great school of architecture in Paris, had, in my time, conceived such brilliant projects? Apparently it had flown to America. For nowhere in the world, during the past decade, can there be found so many architectural masterpieces as have been wrought by American architects in their own country. And so, as I have said, it astonishes me that a field, so exclusively American, so absorbingly interesting, so fraught with wonderful possibilities and so stirring to the imagination as the Greek letter fraternity house, has apparently escaped the attention both of the laymen and architects of this country.

Most of the chapter houses of my fraternity, Delta Kappa Epsilon, have been bought ready made. They are either city, suburban or country residences. It may be said, as an excuse for the acquisition of such houses, that there was not enough money at hand to build chapter houses of a suitable character, with individuality, that would fulfill the requirements. But with sufficient funds, it is to be deplored that in some instances costly residences, lacking in character and good taste and wholly out of keeping with the spirit and traditions of ΔKE have been acquired by well meaning but ill advised or thoughtless alumni; and where new houses have been built, there is not a single instance that I know of in which the building committee has required, or its architect designed, a chapter house wholly in terms of ΔKE.

One of the cardinal principles of good architecture is that the facade and plan shall express in unmistakable terms, easily comprehended by people of average intelligence, the purpose of a building. Let me illustrate by citing a few buildings, for example, in Washington. There is scarcely a person of higher origin and education than a Fiji Islander who, standing before the Capitol, would fail to comprehend the meaning and purpose of that structure. The Capitol is unmistakably a government building. Likewise, the White House is assuredly the residence of a high government official. The Washington Monument could mean nothing but a memorial of some great personage, nor could the Union Station be anything but a railroad station. Whoever has visited the Masonic Temple of Scottish Rites must have been deeply impressed with the beauty and dignity of this noble edifice, and no one could escape the consciousness that in this building occur the solemn rites of a secret order.

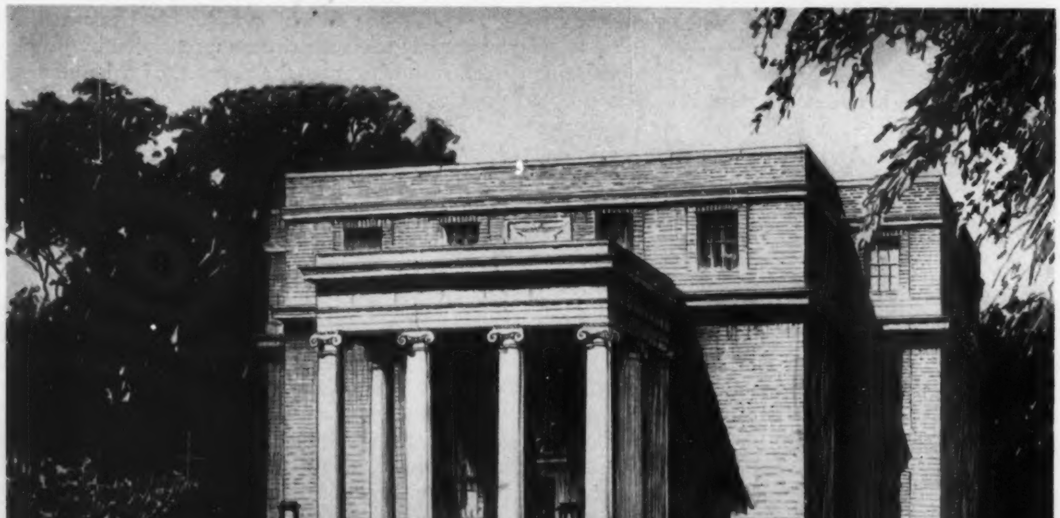
One of the first duties of building committees of future chapter houses is to consider the importance, nay, the necessity, of requiring the architect to design a house that shall have stamped upon its facade and impregnated in the interior atmosphere, the unmistakable fact that it is the dwelling and meeting place of members of a secret and fraternal order. To accomplish this requires little or no additional money over and above the sum needed to build a structurally sound and well designed house.

Just consider for a moment what a truthful expression of the purpose of a fraternity house, in terms of architecture, would accomplish. One of the most poignant moments in your life, a moment when you are lifted into the seventh heaven of relief and joy, is when the bandage is removed from your eyes and the consciousness surges through you that, at last, you have been received into your fraternity. Yet I have been present at initiations in a number of chapter houses—my own included—and with the exception of a few houses which have lodge rooms worthy of the name, what is it that greets the first glance around the room of the newly ordained Deke? Often it is the familiar form and appurtenances of the typical boarding house parlor. And during four of the most formative years of this young Deke's life, when his tastes are mostly acquired, he is forced to live in surroundings that are generally no better than rooms in an ordinary lodging house. To the commonplace environment that is the heritage of most young Americans (and the lodging house is no worse, in this respect, than the house of the uncultivated nouveau riche), is due in a large measure the low average we Americans hold, among the nations of the world, in matters of taste in art and the understanding of it. Many Americans want good art, but few can pick it with any degree of assurance. We generally hire someone to do that for us. The chapter house, intelligently designed and tastefully furnished, will generally do more than anything else to cultivate good taste in the undergraduate fraternity member.

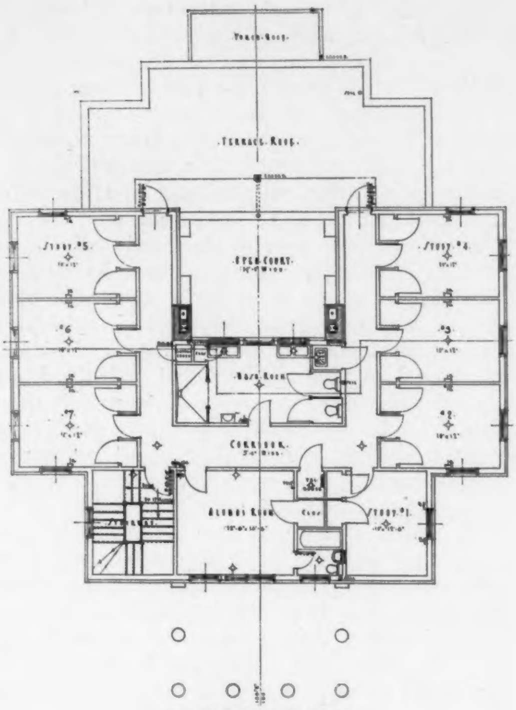
The weekly literary exercises, which most of the chapters have, or should have, would be a hundred times more impressive if they were held in a room with an atmosphere of privacy, dignity and mysticism, instead of in the front parlor—the usual meeting room of some of our houses. This room as a rule has little privacy, and with its miscellaneous collection of early Grand Rapids furniture, department store bric-a-brac, and hand painted photographs, is anything but inspiring.

It should be borne in mind, in building chapter houses, that any scheme which provides ultra conveniences and luxurious appointments cannot be too strongly condemned. To accustom a young man, who has lived in surroundings of a modest character, to a life of ease and affluence, and then turn him out at the end of four years, with the prospect of living in a hall bedroom of a rooming house, is nothing less than cruelty. More harm than good is done, not only to the individual, but to the character and reputation of the chapter, in providing a setting that invites a soft and easy-going college life. A logical consequence will be that the young occupants are either spoiled, or that they are taxed for the upkeep to such an extent that only rich men's sons may enjoy its privileges. This is wholly foreign and contrary to the underlying democratic character of most fraternities.

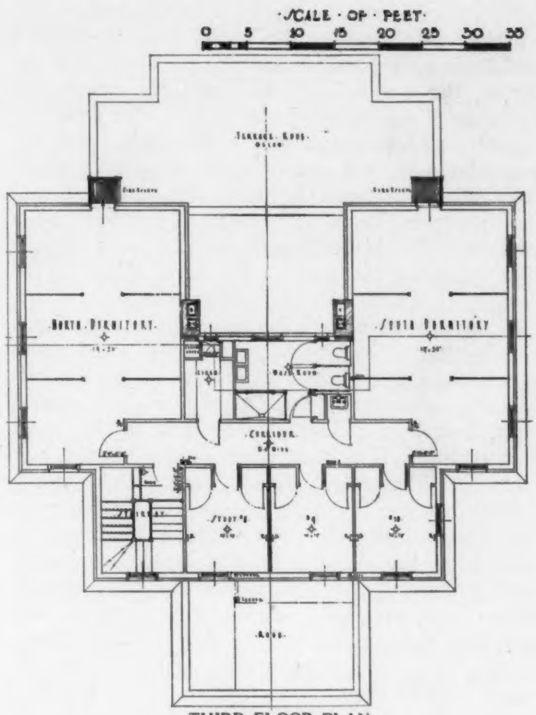
Every fraternity building should, if possible, be fireproof, of sound and durable construction,



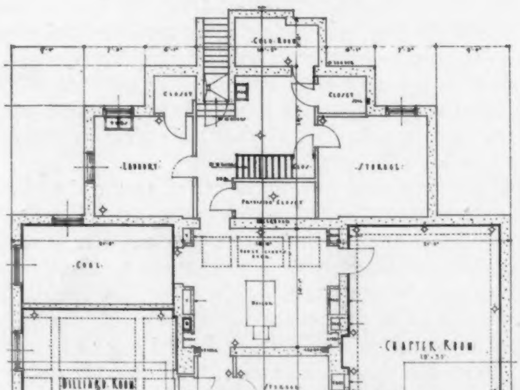
Chapter House, Delta Kappa Epsilon Fraternity, Troy, N. Y.
Oswald C. Hering, Architect



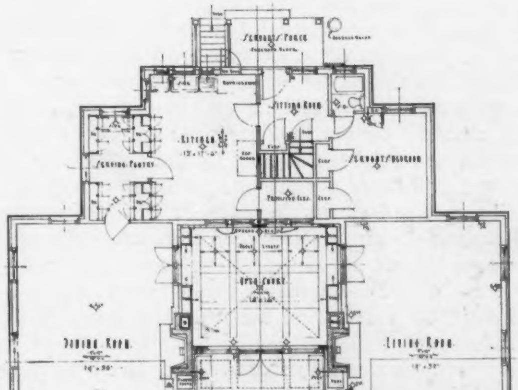
SECOND FLOOR PLAN



THIRD FLOOR PLAN



BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

CHAPTER HOUSE, DELTA KAPPA EPSILON FRATERNITY, TROY, N. Y.

OSWALD C. HERING, ARCHITECT

equipped with reasonable time-saving, money-saving and health-insuring conveniences. Its decorations should be simple and in good taste, using, for example, flat covered stenciled surfaces rather than elaborate plastic ornament in relief. The furniture should be substantial and comfortable, and the general atmosphere one of quiet, dignified, refinement, with a touch of the mystic that will inspire, in the fraternity man, a respect bordering upon reverence for his college home and be a magnet that will draw him back to his Alma Mater by the irresistible forces of pride and satisfaction.

No architecture could be more appropriate for a Greek letter fraternity house than the architecture of ancient Greece. But where the college authorities have already an established plan in a certain style, it may be necessary to conform to that style. For example, if a quadrangle of dormitories and fraternity houses has already been started in the Colonial or the Tudor style (the architecture most commonly used for new college buildings in America), the design for the fraternity houses must necessarily harmonize with the style already adopted. A fraternity house can be made to portray its purpose in any style of architecture, although greater ingenuity on the part of the designer may be required to interpret it, for instance, in the Tudor style than in the Greek style.

Especial care and consideration should be given in planning a fraternity house to have it compact, with a minimum of waste space and other extravagances, for the money which builds these houses is usually secured by passing around the hat among the alumni. In the building pictured, two notable economies have been secured by the substitution of plaster wall board for plaster, and by providing two fully equipped closets for each of the combination study-and-dressing-rooms, thus eliminating the need of two bureaus in each of these rooms and saving the cost of the space they would occupy. The men sleep in the cubicles on the top floor, bathe in the wash-rooms, and then go to their studies—which are also their dressing rooms. Each dressing room closet is equipped on one side with a series of superimposed tills, which hold more than the contents of a bureau and allow the articles of wear to be kept separate and always in view. On the other side of the closet is a rod, with hangers, for clothes. A full-length mirror on the inside of the door completes the equipment.

The dormitory system of sleeping quarters, the study-and-adjacent-bedroom arrangement, and the combination bedroom-and-study, all have their enthusiastic supporters, although the last named is the least popular. There are many arguments in favor of the dormitory, especially when it is divided into cubicles. And these arguments often begin, and end, with the evidence that the dormitory plan costs about a third less than the study-and-adjacent-bedroom plan, which is a potent argument.

The dormitory system came to us from the English schools. It has the advantage not only of securing a great saving in space,—and consequently in cost,—since four men can be accommodated in a dormitory in the same space that is taken by two men in a bedroom, but the dormitory insures better health of the occupants, since the larger room contains a greater volume of air and more windows, guaranteeing better ventilation. The dormitory tends to raise the standard of scholarship, for it is difficult for several boys to sleep and study in one room or in adjoining rooms without interruption. When the dormitory is on one floor and the study room on another, regular sleeping and study hours can be maintained without disturbance. Discipline and general morality are improved with the dormitory system. When a couple of boys lock themselves in a bedroom, they can drink, gamble and deport themselves in ways they would not venture to do in public. In a dormitory everyone becomes more or less acquainted with the conduct of his mates, and if a man gets drunk night after night, or stays out all night, it is known not only to his roommate but to practically everyone in the chapter. This deters men from wrongdoing, for there are always a number of men who have a sense of obligation to others, and the seniors in particular are able, under a dormitory system, to keep an eye on their younger brothers and help them when they show an inclination to stray from the beaten path. The dormitory system has a further beneficial effect on the men—because it is democratic. It puts all men on the same level, and each one gets acquainted with the others, which is not always possible when the men live, study and pass their time in separate rooms on different floors.

The objection sometimes raised to the dormitory is the natural hesitation to adopt a new plan unlike that which may exist in other houses. For in social matters, college boys are the most conservative creatures in the world. Often, too, the seniors do not like to be put on the same level with the freshmen—and finally, all men desire privacy to a certain extent, and some are so constituted that they always like to be alone, except when it is necessary to mingle with the crowd, as at meal times and at meetings. But with the dormitory divided into cubicles, and with separate study rooms to accommodate one, two, or more men as agreed, most of these objections are overcome.

The perspective is purposely shown almost in a full front view, so that the entrance portico and the tripods, flanked by unbroken walls, should stress the Greek motif and the mystery. The other three facades are liberally punctured with windows (as the floor plans show) stressing the domestic character of the building, which could be still further accentuated by window blinds. The tripods, on either side of the entrance, are intended, upon nights of initiation, banquet, or important occasions, to be filled with oil and lighted, as an indication that a special event is transpiring within.

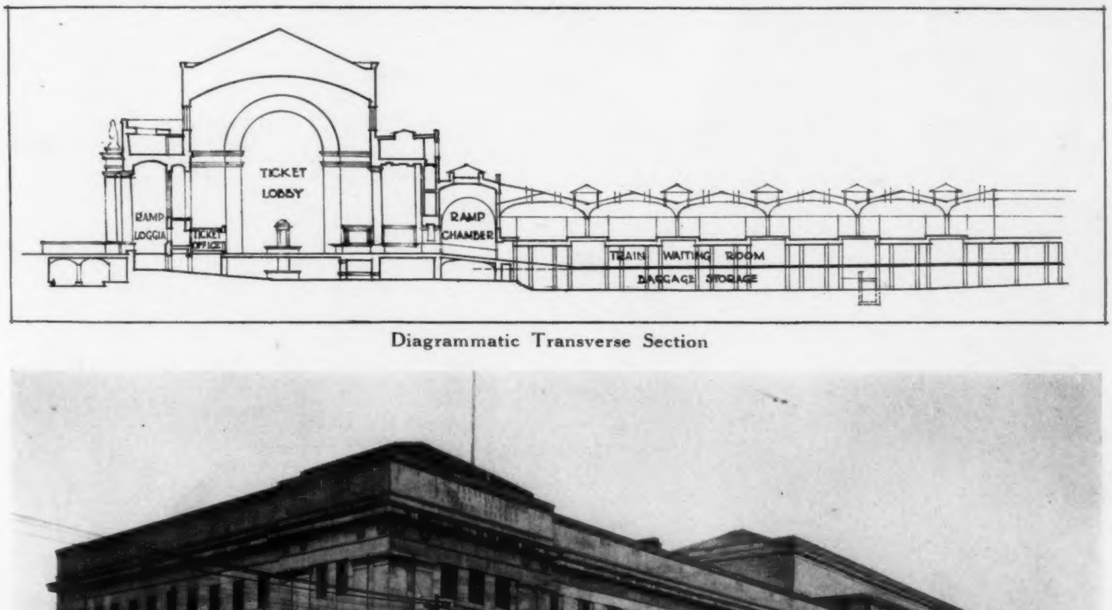
The Union Station, Toronto

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS
JOHN M. LYLE, ASSOCIATE ARCHITECT

THE construction of this building was begun in 1915. The portion illustrated was completed in 1920. The post office and office wing are now in use, but the station itself is not, owing to a lack of agreement between the city, the harbor authorities and the terminal company, which has resulted in delaying the construction of approaches and station trackage. As originally designed, access to trains through a train waiting room under raised tracks was intended. At the time construction was begun, however, changes were made in the plans of the station making it workable with either high or low level trackage. A number of alternate plans for track platform access are now under consideration. That illustrated is the original plan, showing the under-track train waiting room.

The areas shown are based upon a very careful study of the relation of space to business handled at other terminals doing a similar business. The daily business at the old terminal for the year 1913, when the new station was planned, was approximately: through trains, in and out, 130; loaded cars, 1,000; baggage (pieces) 10,000; parcels (pieces) 1,500. The Pennsylvania Station, New York, 1921 figures indicate 181 through trains per day. The Grand Central, 1921 figures indicate 133 through trains per day. The baggage business here is rather heavier than at either of the New York stations. While there is no suburban business at Toronto, the peak passenger business at exhibition time in August of each year is very heavy, and made necessary the provision of large station areas and the separation of in and out passengers.

The effort in planning was, as far as possible, to arrange all portions of the station in such sequence as to allow passengers to transact their business and pass to or from trains with a minimum of cross traffic current or retracing of steps, and to so place the various parts that the indicating signs can be read from any part of the ticket lobby, and more



Diagrammatic Transverse Section

General Exterior View, Union Station, Toronto

Restaurant Kitchen

Cab Stand, Lower Level

particularly the information booth. The sequence for outgoing passengers is: ticket office, information booth, parcel claim counter, baggage checking counter, telegraph and telephone, newsstand, train waiting room for non-waiting passengers, and ticket examination booth at the foot of each platform stair.

Waiting passengers find the general waiting room, dining room and toilets and other conveniences for passengers at the west end of the station.

Incoming passengers leave the train platforms by separate exit stairs and passages and pass through the low level concourse and up ramps under the colonnade to the street. In the low level concourse are provided counters for claiming of hand baggage, baggage transfer, parcel checking counter, and practically duplicates of the news, telegraph and telephone facilities provided on the floor above. Transfer passengers reach the outgoing portion of the station by stairs at each end. For close connection transfers, a controlled communication from exit passages to train waiting room is provided. The parcel and baggage checking and claim rooms are provided with communicating stairs, elevators, dumbwaiters and conveyors connecting the two levels so that they may as far as possible be operated as one facility. Baggage checking is by claim check and pneumatic tube to weighing scale in baggage room. Incoming passengers find the customs offices at the west end of the low level concourse. Outgoing cab passengers arrive at the

Cab Entrance, Lower Level, Looking toward Arches to Ramp

Lunch Room

Parcel Check Room

same cab stand and ascend stairs to the ticket lobby. A provision, growing out of the difficulty at the old station, is that all incoming passengers enter the low level concourse at one point where they may be readily found by waiting friends. Train arrival and departure times are shown on indicator rolls behind the information counter in the center of the ticket lobby. The exits from trains leading to each end of the ticket lobby show an alternate communication which may be used if operation of both levels is not considered necessary except during heavy traffic periods, thus providing for varying conditions.

Foundations are of concrete carried down to rock in open caissons. Structural steel columns, and beams in exterior walls, are all protected with poured concrete. Heavy traffic basement and main station floors are of reinforced concrete. All other floors, fireproofing and partitions are hollow tile. Baggage room floors are mastic; of office, composition; of toilets and similar areas, tile; corridor and public room floors are in Tennessee marble. Working area floors in post office are in maple; dining room floors, oak laid in mastic. No cinder concrete was allowed in contact with pipe work in any part of the work. Ramp floors are of tile. The exterior wall facing is mixed Indiana limestone, rubbed finish. Double-

Waiting Room, Union Station, Toronto

hung windows are of wood, the larger openings having iron frames and steel sash. Pitched roofs are of copper.

The interior wall facing of the ticket lobby, general waiting room and ramp chamber (when it is built) is of travertine, rough sawn face. Floors in public rooms are generally in varying shades of pink and gray Tennessee marble. Ticket, baggage and parcel room screens, stair balustrades and information booth are clear face pink marble. The ceiling of the ticket lobby is in three shades of tile. The ribs quite closely match the color in the stone wall facing; the panels are a complementary gray. Metal work in the large openings is painted in gray contrasting with the stone color. Metal work within 15 feet from the floor, with the exception of bronze wickets and all parts subject to wear, is of cast iron painted, glazed and wiped to imitate bronze. Dining room paneling is of fumed and waxed oak with carved ornament. The floor border is black marble and base dark pink Tennessee.

Detail in Ticket Lobby

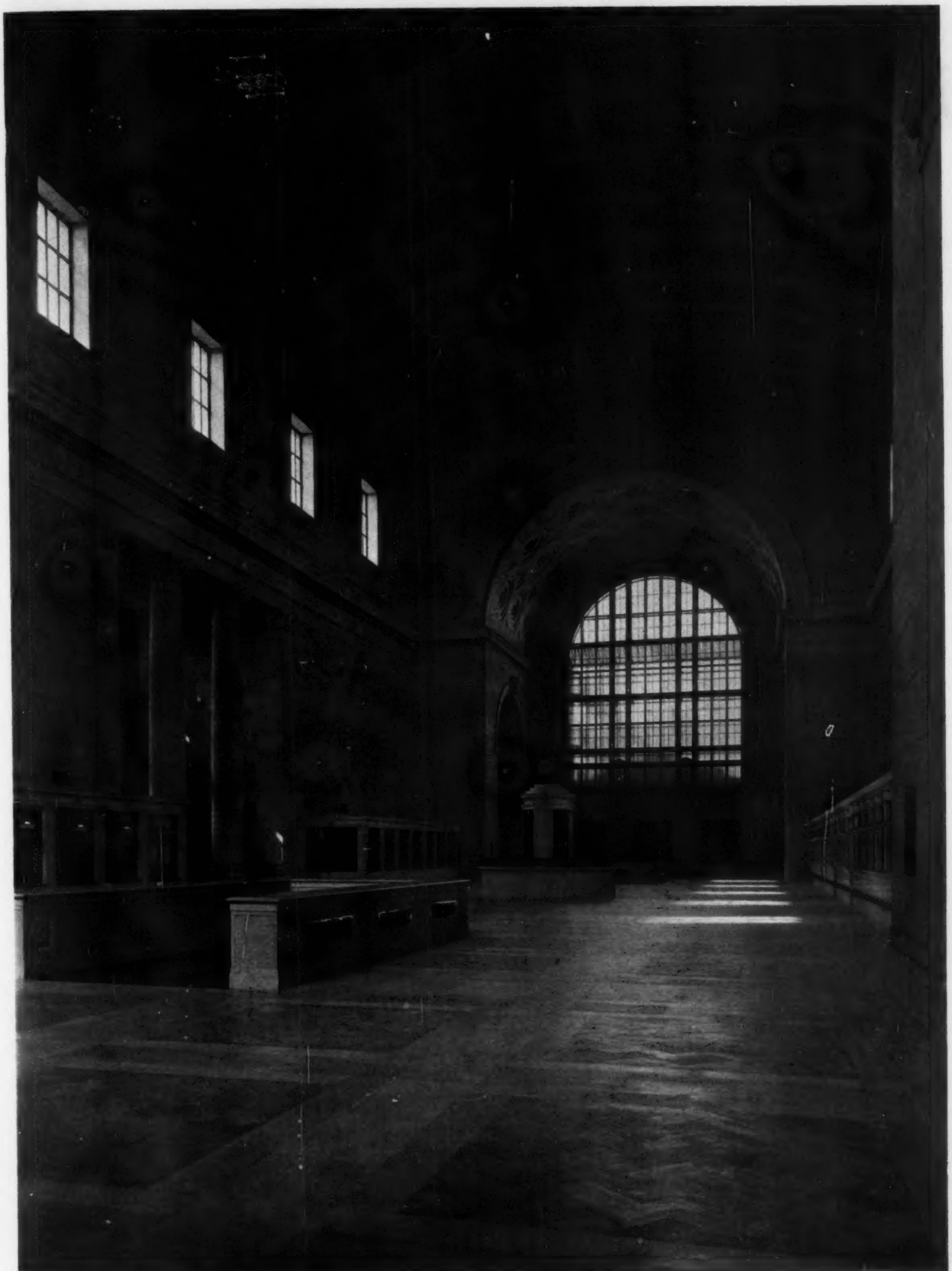
The lighting of the ticket lobby is, with the exception of five recess fixtures, by trough fixtures placed over ticket, baggage checking and parcel room screens. The exterior standards between columns at exit ramps are for flood lighting the wall back of the colonnade. The general waiting room and dining room are lighted through the glass ceiling. Supplementary fixtures and floor plugs are provided for auxiliary local lighting.

The heating and ventilating of the ticket lobby, exit concourse, immigrants' waiting room, general waiting room, dining room and toilets throughout the building, are entirely by blower and exhaust fan systems. All other portions of the building are direct steam heated, with in some cases air supply and exhaust, and in other cases exhaust only.

Including the post office, the building contains about 10,000,000 cubic feet. This does not include any allowances for retaining walls and approaches. The total cost, including architects' and contractors' fees, amounted to about $6,000,000. There is no power house included in the scheme, as both steam and current are purchased from outside sources, thus adding to the area which is available for the ordinary station purposes.

Detail of Ramp Rail

Ramp behind Colonnade

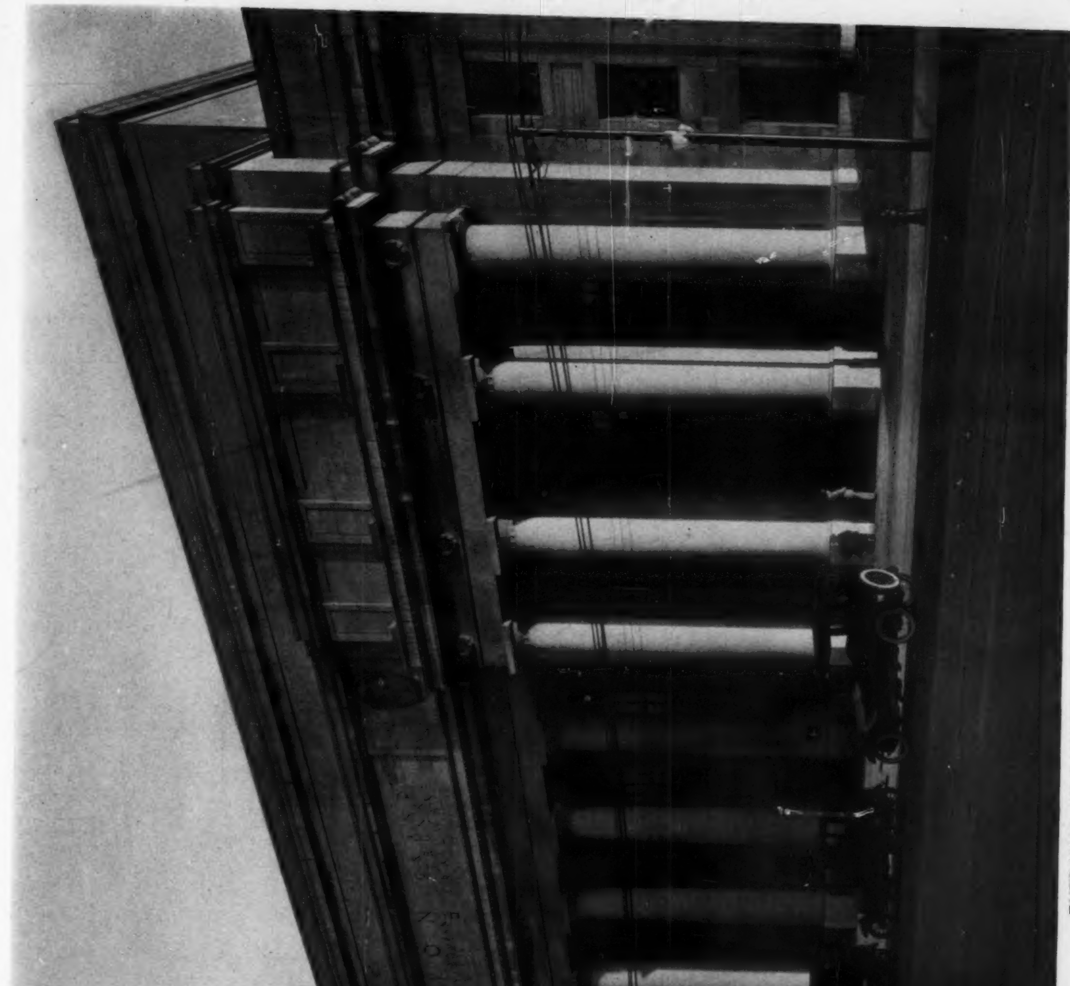


TICKET LOBBY LOOKING TOWARD WAITING ROOM

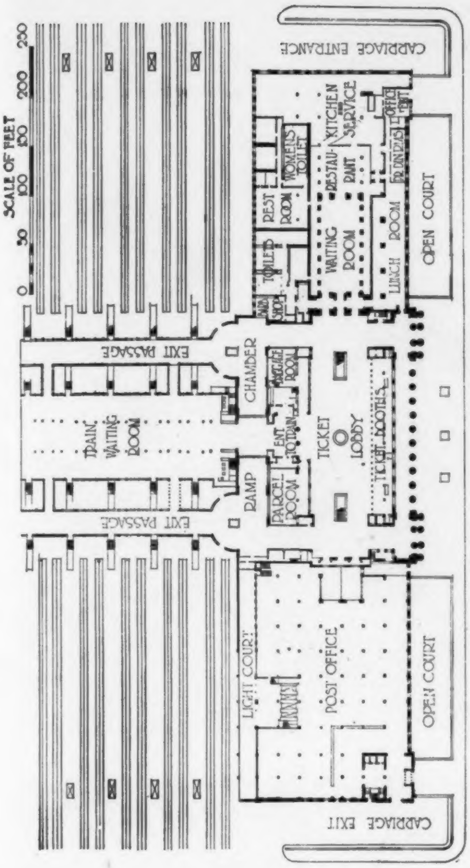
UNION STATION, TORONTO

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE

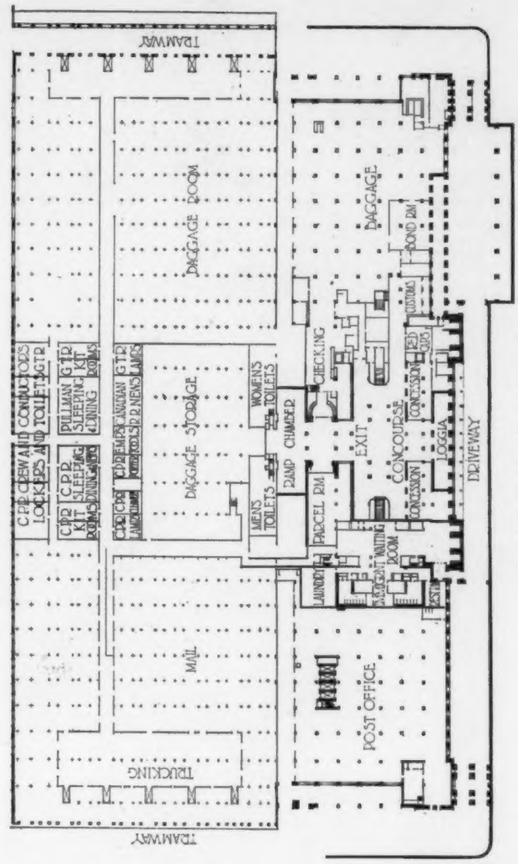
Photos, Paul J. Weber



ENTRANCE COLONNADE
UNION STATION, TORONTO
ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE



FLOOR PLAN AT MAIN LEVEL



FLOOR PLAN AT LOWER LEVEL

DETAIL OF ENTRANCE COLONNADE

UNION STATION, TORONTO

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE

CORRIDOR BETWEEN TICKET LOBBY AND WAITING ROOM

DETAIL OF POST OFFICE ENTRANCE

UNION STATION, TORONTO

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE

TRAIN CONCOURSE ENTRANCE

TICKET LOBBY SHOWING INFORMATION COUNTER

UNION STATION, TORONTO

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE

Architectural
Library

VIEW ACROSS TICKET LOBBY FROM CONCOURSE

SERVICE END OF RESTAURANT

UNION STATION, TORONTO

ROSS & MACDONALD AND HUGH G. JONES, ARCHITECTS; JOHN M. LYLE, ASSOCIATE

GENERAL VIEW OF ENTRANCE FRONT

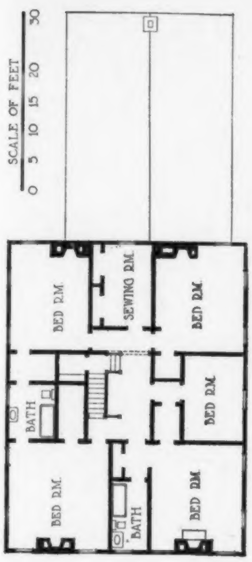
GENERAL VIEW FROM GARDEN

HOUSE OF MRS. R. M. BISSELL, FARMINGTON, CONN.

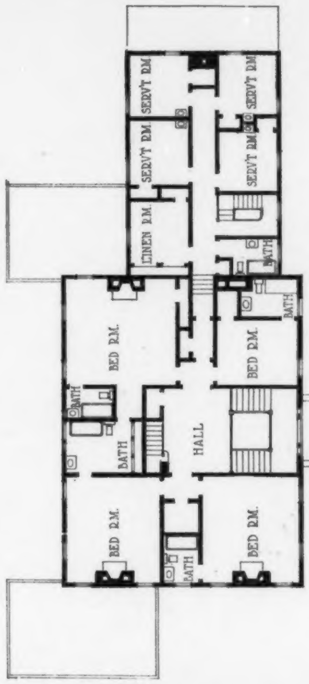
EDWIN S. DODGE, ARCHITECT

Photos, Paul J. Weber

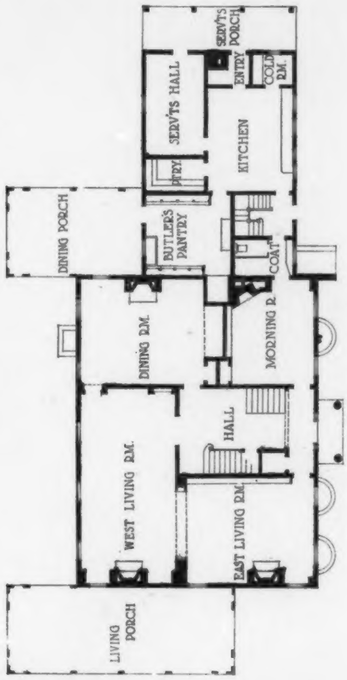
Architectural
Library



THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

STAIR HALL

HOUSE OF MRS. R. M. BISSELL, FARMINGTON, CONN.

EDWIN S. DODGE, ARCHITECT

END OF WEST LIVING ROOM

ARCHWAY TO EAST LIVING ROOM

HOUSE OF MRS. R. M. BISSELL, FARMINGTON, CONN.

EDWIN S. DODGE, ARCHITECT

EAST LIVING ROOM MANTEL

DINING ROOM MANTEL

HOUSE OF MRS. R. M. BISSELL, FARMINGTON, CONN.

EDWIN S. DODGE, ARCHITECT

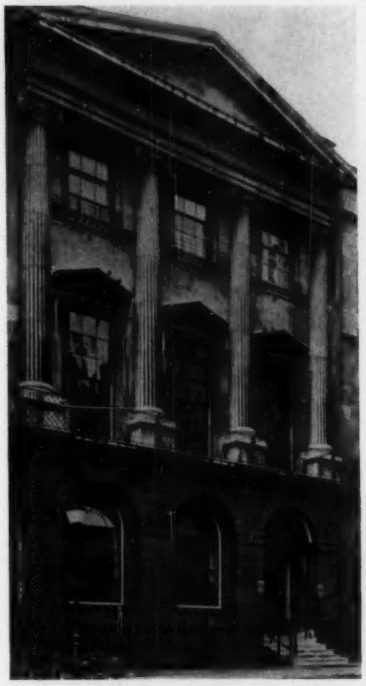
The Greek Revival

II. ITS MANIFESTATION IN ENGLAND

By HOWARD MAJOR

Unlike Americans, the English were not completely swept off their feet by the Greek revival, nor did it have their undivided attention. In England the Gothic revival was contemporary with the Greek phase throughout its entire duration. The British mind and the British architect were amenable to these two styles, and therefore the extent of the Greek revival was limited in comparison to its scope and realization in America. The English expression inclined toward too much originality and the too frequent adoption of motifs unharmonious with Greek forms.

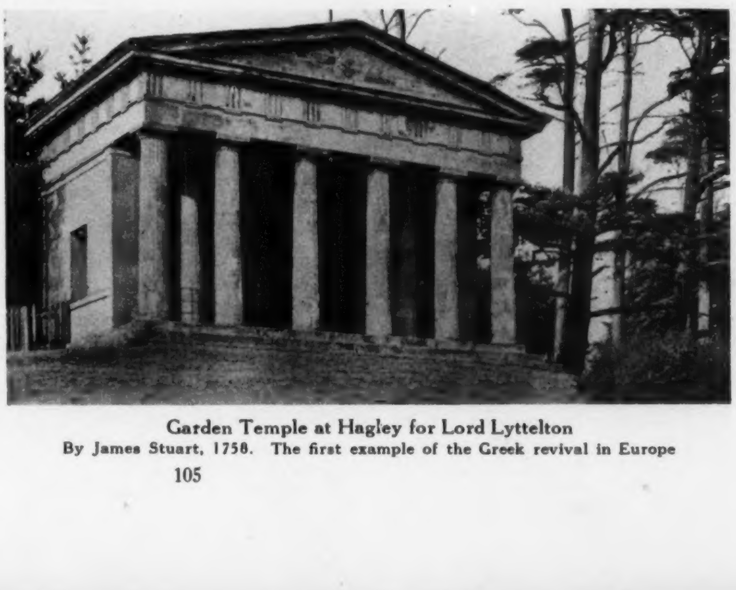
Nevertheless, these faults were to produce the masterpiece of the day: the Greek pedimented church with the high spire centrally located. The result was a composition of dignity, grace and refinement, which may be compared with the architecture of all times. Furthermore, in England the Greek phase in its entirety was adapted to public buildings, whereas the Gothic was more commonly used for clothing the smaller domestic work. In America we can follow its development by means of the home, but in England we have to resort to the public edifice. It is a deplorable fact that we have practically no photographic record of small English houses of the Greek phase. In fact, it is to be regretted that we have very scant data of the small house throughout Europe. In this respect Europe may learn a lesson from us and imitate our exhaustive research on Colonial architecture, and we may in turn direct attention to our Greek revival and procure photographic data to hand down to posterity.



No. 15 St. James Square, London
By James Stuart, 1760. The first example of the Græco-Roman school

In the spirit of the classic tradition, as in all great periods of the past, lies the greatest promise for art in the future. The Greek phase approaches the essence of classic tradition more nearly than any period heretofore. For a century it has lain dormant, but today there is a growing appreciation of it and an interest which replaces the indifference and derogatory criticism of yesterday.

The forces that led up to this movement began long ago, far back in the days of Inigo Jones. The movement first bore definite fruit in the early eighteenth century and consistently developed with the aid of constantly increasing data on classical architecture. Under the patronage of Lord Burlington there developed a definite trend toward correct interpretation of Palladio's works which was further strengthened by direct study of Roman ruins. In 1715 appeared the first English translation of Palladio by Giacomo Leoni. Nothing will more adequately illustrate the trend of the time than a review of the many translations of Palladio. In 1721 a second edition of Leoni's work was published. In 1729 Colin Campbell's translation appeared, to be followed in 1735 by the version of Edward Hoppus with still another edition in 1736. Then Isaac Ware's well known translation appeared in 1738, to be followed by two further editions. Thus was born the Roman Palladian phase, which was to continue throughout the entire eighteenth century. In 1753-1757 Wood and Dawkins published two volumes upon Baalbec and Palmyra, thereby directing attention to the magnificence of Roman architecture. The next step, and



Garden Temple at Hagley for Lord Lyttelton
By James Stuart, 1758. The first example of the Greek revival in Europe

The Castle, Chester, 1793-1820
By Thomas Harrison. The entrance portico, with its two flanking temples 35 years later than Hagley, is another of those curious isolated examples,—forerunners of what was to follow

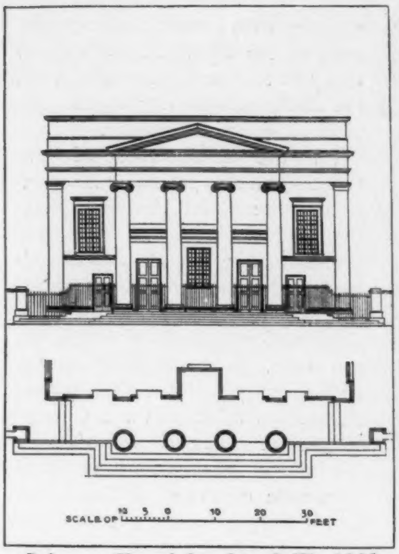
The distinction of being the first architect of the Greek revival in all countries belongs to James Stuart, the pioneer in Greek research. As early as 1758 he designed and built the Greek Doric garden temple at Hagley for Lord Lyttelton. In this stone structure he produced a hexastyle temple with a massive dignity and refinement such as might have been created by the ancients. This building was the prototype of the prevailing style of 60 years later, and was the first Greek architecture to appear in western Europe. Although this is a building for domestic use, it must not be confused with a dwelling, as it was not used for such a purpose. The garden temple had for many years been a favorite form of decorative expression. Stuart, in this garden temple, completely broke away from the Græco-Roman school, to which he gave origin two years later in his design for No. 15 St. James Square (1760). This school was to gather its momentum in 1780 and endure until 1820. Here Stuart exhibited his versatility by adapting Greek forms to the vernacular style of the Palladian school. He was also the architect of the chapel at Greenwich Hospital, in which he placed an interior portico of a Greek Ionic order with an ingenious intermingling of Renaissance detail.

from this dates the birth of the Greek phase, was the appearance of Stuart & Revett's first volume of their famous "Classical Antiquities of Athens," published in 1762. Many volumes on Greek and Roman architecture now appeared and continued to appear throughout this as well as the following century.

St. Pancras' Church, London, 1819-1822
The Inwood brothers, Architects. The "chef-d'œuvre" of the phase. The delightful composition of the churches of this period is a tribute to English taste

Of all the great English architects of the eighteenth century there was not one whose influence was destined to be felt in the succeeding century as was Stuart's. However, he had few opportunities, for being in advance of the popular trend, his commissions were naturally limited in number. At this time the brothers Adam justly controlled the field of British architecture, far eclipsing Stuart and his contemporaries. Yet his pioneer labors instantly acted as a check to the prevalent style and somewhat aided the Adams' manner of classical restraint.

Henry Holland (1744-1806), who next appears on the scene, at the time created attention as the originator of the Græco-Roman style, although the title properly belonged to Stuart. In 1786 he executed for the Duke of York a



Belgrave Chapel, London, S. W., 1825
Sir John Smirke, Architect

The Custom House, Glasgow
By George Ledwall Taylor. Very late Græco-Roman phase; splendid, restrained design, worthy of study

charming Greek Ionic portico. In 1799 Holland was successful in competition with Soane and Dance for the East India Company's building. The facade included a pedimented portico of the Greek Ionic order. Holland possessed a large practice, but the most of his work was in the style of the Palladian school. His later work was derived from this school, leavened with Græco-Roman detail. Thus was the seed of Greek architecture sown; many buildings with Greek detail of this Græco-Roman phase now flourished everywhere. One of the architects of this school, particularly interesting to us, is S. P. Cockerell (1754-1827) because of his pupil, Benjamin Latrobe, with whose work we are all familiar.

In 1793, 35 years after the building of Stuart's garden temple at Hagley, we again find an isolated example of a Doric temple in two small buildings flanking the Greek portico entrance to Castle Chester. Thomas Harrison, the architect, secured this commission in competition, and although the entire work was not completed until 1820, we may assume, without evidence to the contrary, that his prize winning design of 1793 was carried out. This building and Stuart's temple at Hagley are isolated examples, and it is not until 1820 that we find the pure Greek revival under full swing.

Of this period of 1800 the reputation of no contemporary has survived as has that of Sir John Soane, who left to posterity his home together with his superb collection of furnishings, library and art objects. This museum is unique in that it gives one an intimate insight into the art and life of the period. It is one of those personal, small affairs which create an endearing impression which the large galleries fail to give. Soane was born in 1753 and died in 1837. After winning honors as a student of architecture in England, he traveled in Italy, returning in 1780 to begin an undisputed practice. In 1788 he was appointed architect for the Bank of England, and fresh honors were frequently awarded to him.

Elevation of a Villa
From "Sketches in Architecture," by Sir John Soane, 1798. An early example of a dwelling in the Greek style

Villa in Regent's Park, London, 1822
Decimus Burton, Architect. From "Public Buildings of London," by Pugin and Britton, London, 1838

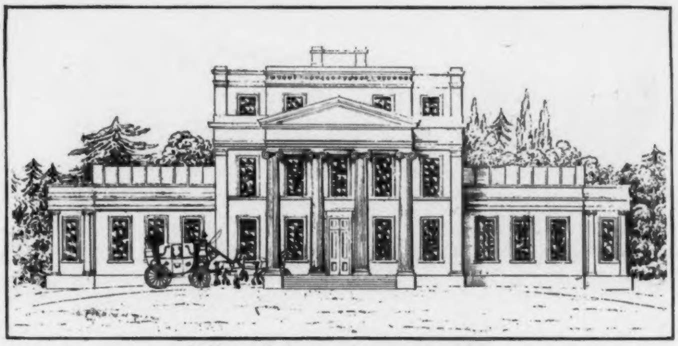
His greatest work is the Bank of England, with which we are familiar. Soane accomplished nothing toward furthering the cause of the Greek revival, but it would not be fitting to write of this period without mention of this famous architect. His egotism, resulting from the many honors bestowed, caused him to believe that he could create an original architecture. This presumption was his great fault and the cause of a large amount of unfavorable criticism. However, strange to relate, Soane appreciated the inestimable value to an architect of a good library, a lesson most of the architects of today may take to heart. Soane's deterioration from the higher standards of his earlier work may be readily traced through an examination of his successive monographs, which from time to time were generously offered to the public. At least we must admit that Soane for his day clearly understood the value of advertising through these publications. In fact he could serve as an exponent of the advanced methods of today in that he further advertised his name to posterity by the gift of his home as a museum.

Of the architecture of this Græco-Roman period none, excepting the garden temple of Hagley and the entrance to Castle Chester, indicated an understanding of the spirit of Greek architecture. It consisted of a thorough understanding of Greek detail only, to be applied to the Palladian style of the day. A good illustration of this is the Custom House at Glasgow by George Taylor. The Doric order is an admirable example of Greek detail, but wherein can one find the Greek spirit with the order used over a prominent basement story? It is, however, a splendid, restrained design and an unusually fine blending of Palladian and Greek architecture.

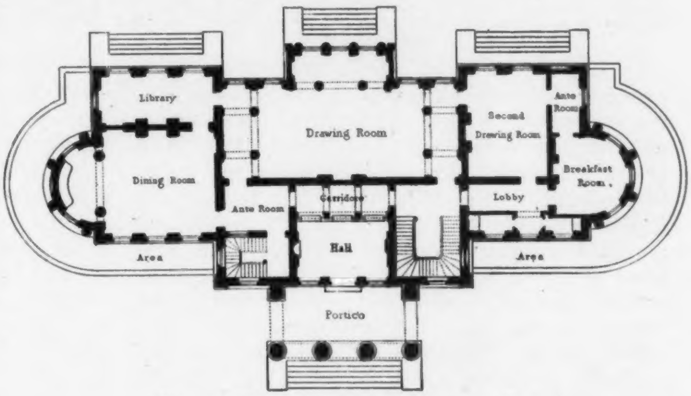
The Greek Revival, 1820-1850

There is no doubt but that this architecture of the early years of the nineteenth century is deserving of close scrutiny. It was 60 years before that Stuart had published his "Antiquities of Athens". In the interval much Hellenic knowledge had been circulated and absorbed. Public opinion had slowly come to an acceptance of the Greek refinement and dignity. The exponents of the Greek phase now devoted their whole attention to the transformation of Hellenic art to England. The movement by 1820 had gathered full momentum. In America the Greek temples were faithfully reproduced, ranging from monumental state edifices to the most humble domiciles. In England this was never attempted for the private dwelling and only in rare instances for public buildings. The British version was a combination of Roman planning with the Greek orders, and a not unhappy ensemble often resulted. The Palladian features of the preceding period disappeared, but the magnificence of Roman compositions, together with such features as its domes, were retained. However, the true simplicity of Greek architecture is found wanting. This is exemplified in the interiors where the Greek orders are found surmounted by vaulting and domes. In the churches, the fine spires of Christopher Wren were retained, clothed in Greek detail, and this apparent incongruity evolved many

Preliminary Design for the Fishmongers' Hall, London
By Henry Roberts, 1831. The Parthenon boldly and bodily adapted to an imposing site overlooking the Thames; the extreme realization of the phase



Villa in Belgrave Square, London
H. E. Kendall, Architect, 1826. From "Public Buildings of London," by Pugin and Britton



Plan of Villa in Belgrave Square, London

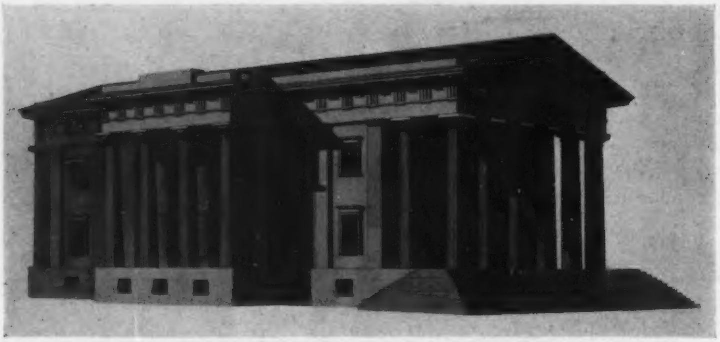
chef-d'œuvres of the Greek phase.

It is interesting to note the natural misstatement Mr. A. E. Richardson makes in his excellent work "Monumental Classic Architecture in Great Britain and Ireland in the XVIII and XIX Centuries". To quote, "In consequence, by the year 1820 the Greek phase was fairly established in England, to react to a great extent on the architecture of Europe and America." His misconception regarding America, no doubt hastily assumed, is clearly proved in the preceding article upon the classic revival ("The American National Expression," in THE ARCHITECTURAL FORUM for February). I further very much doubt the influence upon France, whose architecture had already been revolutionized upon classical lines by Napoleon. Moreover, the French archæologists in their researches at Athens anticipated Stuart & Revett by three years. Even in the heyday of the phase the true spirit of Greek architecture was never assimilated except in individual instances. In fact there was a constant striving in the opposite direction, which resulted in much original expression of great merit. This attitude is expressed by an excerpt from Mr. Richardson: "The enthusiasm for refinement in architecture and the kindred arts grew apace, and though excess of zeal prompted some exponents of 'Greek' to literally reproduce the temple frontals of Greece, on the whole the development was steady".

William Wilkins (1778-1834), associated with J. P. Gandy-Deering, designed in 1827 the University College of London, a chaste design, but illustrating the inclusion of the dome, thereby very much detracting from the beauty of the ensemble. In 1824 Sir Charles Barry designed and erected the art gallery at Manchester, a Greek adaptation to modern use without incongruous features.

To Sir John Smirke belongs credit for being the first architect to boldly combine Greek monuments with Roman planning. This is exemplified in his design of 1825 for the British Museum, in which his central portico is composed of eight Ionic columns in a thoroughly Greek manner. The facade in its entirety, however, becomes monotonous with its myriads of columns unbroken by contrasting surfaces. In his design for the General Post Office, London (1824-1829), with a chaste adoption of Greek forms, he has avoided this monotony. In 1825 he built Belgrave Chapel, a design of merit, exhibiting the restraint and simplicity of true Greek spirit. Unfortunately, this lovely little chapel has recently been demolished. Sir John Smirke's influence for a truer Greek interpretation throughout the country was considerable, and he stands out as one of the important as well as determining factors of the time.

The High School, Edinburgh
By Thomas Hamilton, 1825. This building creates the impression of its character being appropriate to its environment

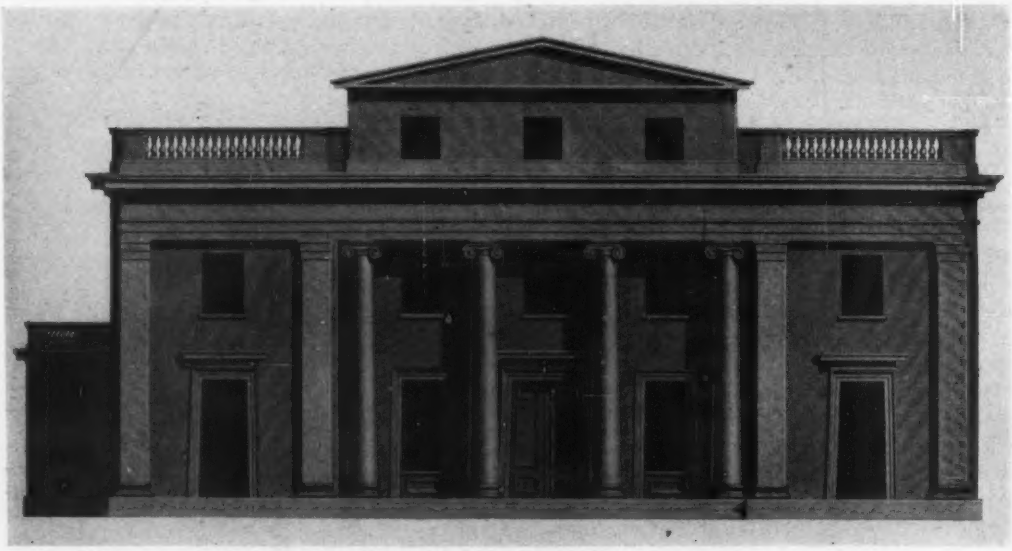


Design to Elucidate the Style of Grecian Architecture
From "Plans and Views in Perspective with Descriptions of Buildings." By Robert Mitchell, 1801. Here the temple form is adapted for domestic purposes as in America, but the author had no idea of its being executed, as he writes: "For a design, confined to the simple plan of the Grecian Temple, would be found as inapplicable to a modern mansion, as the Greek tragedy has been experienced to be unfit for the English stage"

In England as in no other country this period produced delightful churches. There was no other type of building so well expressed in Greek terms, and strangely enough their problem was a formidable one of the vertical spire in direct opposition to the predominant horizontal lines of Greek architecture. In his rendering of this problem the Englishman produced his masterpiece of the century. He combined with great skill and freedom the Greek temple with the fascinating spires of the preceding century. There was thus created a jewel possessing monumental dignity. There is not the least feeling of incongruity in these pleasing spires clothed in Greek detail which only seem to accentuate the composition of the Greek porticoes under them. Such a church is St. Pancras' (1819-1822) by the Inwood brothers. It is the essence of beauty and a tribute to English taste. The extreme realization of the phase was attained in a design by Henry Roberts in 1831 in which he boldly adapted the Parthenon upon an imposing site overlooking the Thames. It was a bold, monumental conception, but too radical for the English temperament and was ultimately abandoned for a scheme reminiscent of the work of the Adams.

While the Greek school was gaining adherents in London many provincial architects were quickly taking up the movement and erecting interpretations throughout the kingdom. In 1822 Francis Goodwin constructed the assembly rooms in Manchester, which compared favorably with the work of the London architects. Edinburgh offered a more fertile soil than London for the seed of Hellenic art, and was the "Modern Athens."

A remarkable feature of the time was the great number of architects who traveled to Greece and Rome to complete their studies. Of the prominent men nine out of ten had this advantageous opportunity, which directly influenced architecture of this style. These students, after viewing and realizing the grandeur and magnificence of Roman antiquity, were not satisfied with merely Greek temples. To a man their conception of a great modern architecture was a combination of Greek simplicity with Roman magnificence, and this constant use of the Greek order upon a Roman plan is strongly mirrored throughout the revival. Furthermore, these traveled architects were so thoroughly familiar with the three Greek orders that the orders were employed from the first without preference or in any traceable sequence such as was discernible then in America.

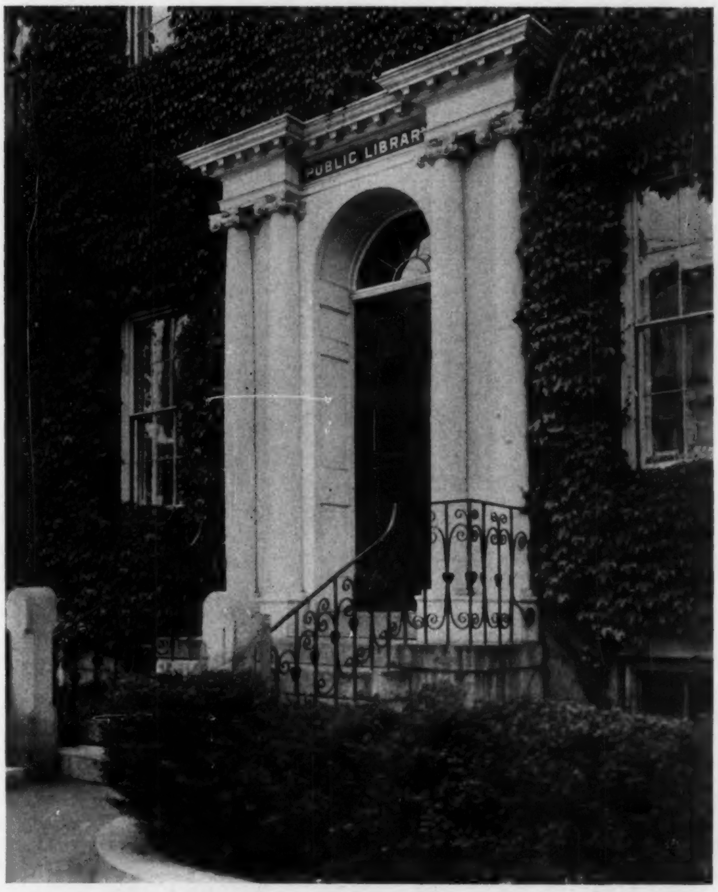


House Erected for General Taylor in Ireland
From "Plans of Buildings, Public and Private," by David Laing, 1818. It illustrates the radical difference in domestic work between the English and the American phases.

DETAILS OF EARLY AMERICAN ARCHITECTURE

A SERIES OF MEASURED DRAWINGS

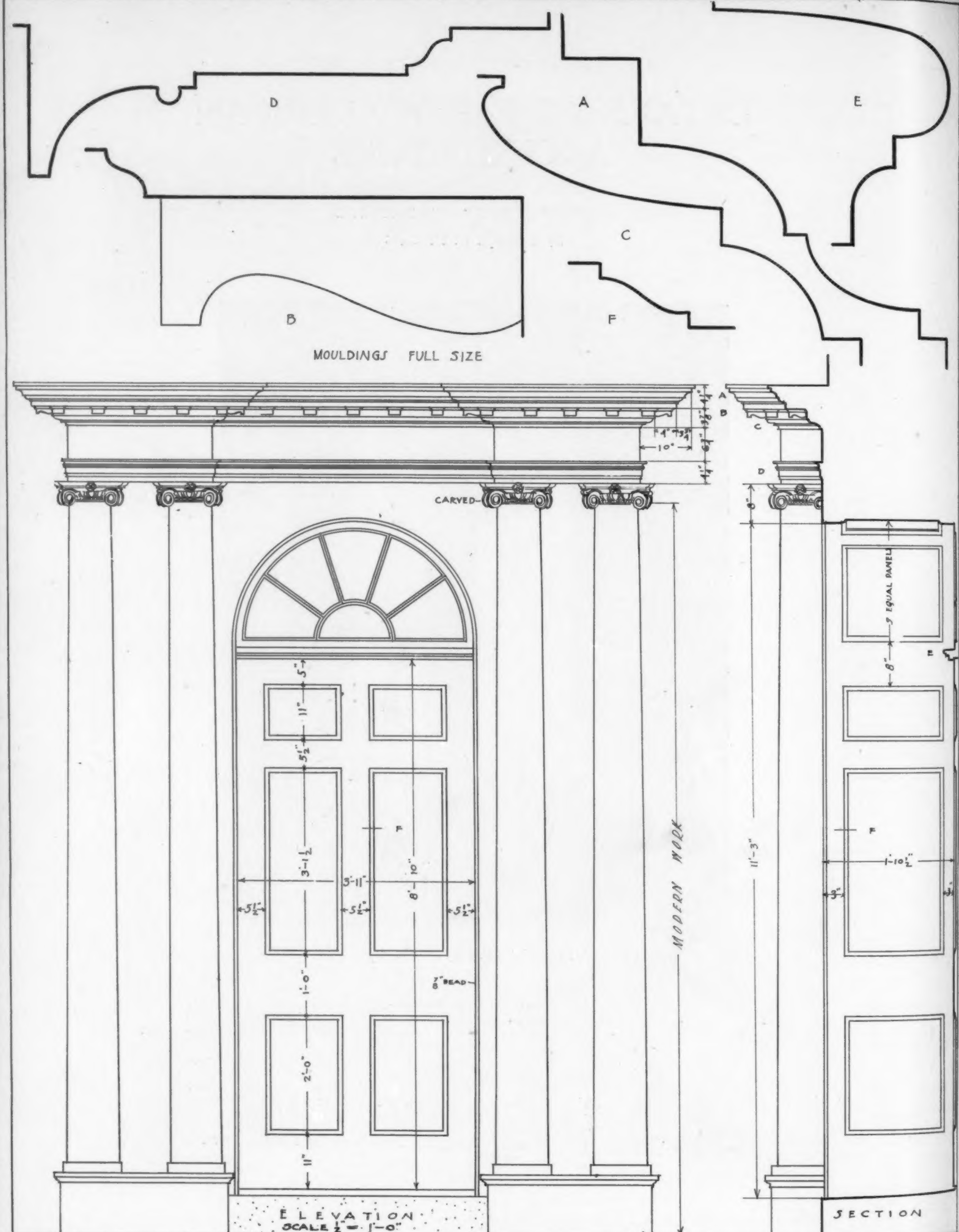
By GEORGE H. HIGGINS



DOORWAY, PUBLIC LIBRARY, PORTSMOUTH, N. H.

NOTWITHSTANDING the destruction of excellent examples of architecture which goes on unceasingly, a surprising number manage to survive. An old building may outlive its usefulness for its original purpose and then be converted to some other use, its very excellence indeed being sometimes the reason for its preservation. This is true of the structure designed by Charles Bulfinch and erected in 1806 for the Portsmouth Academy, which later became a school and later still a public library.

The main doorway of the building, which is its most admirable architectural feature, is quite representative of Bulfinch's most graceful work. The pediment is supported upon four engaged columns, and one detail which is incorporated in many of Bulfinch's structures is found in the agreement of the paneling of the door with that of the reveal caused by thickness of the red brick wall, the arch framing the transom arranged in three panels.



·PLATE·48·
·MARCH·1924·

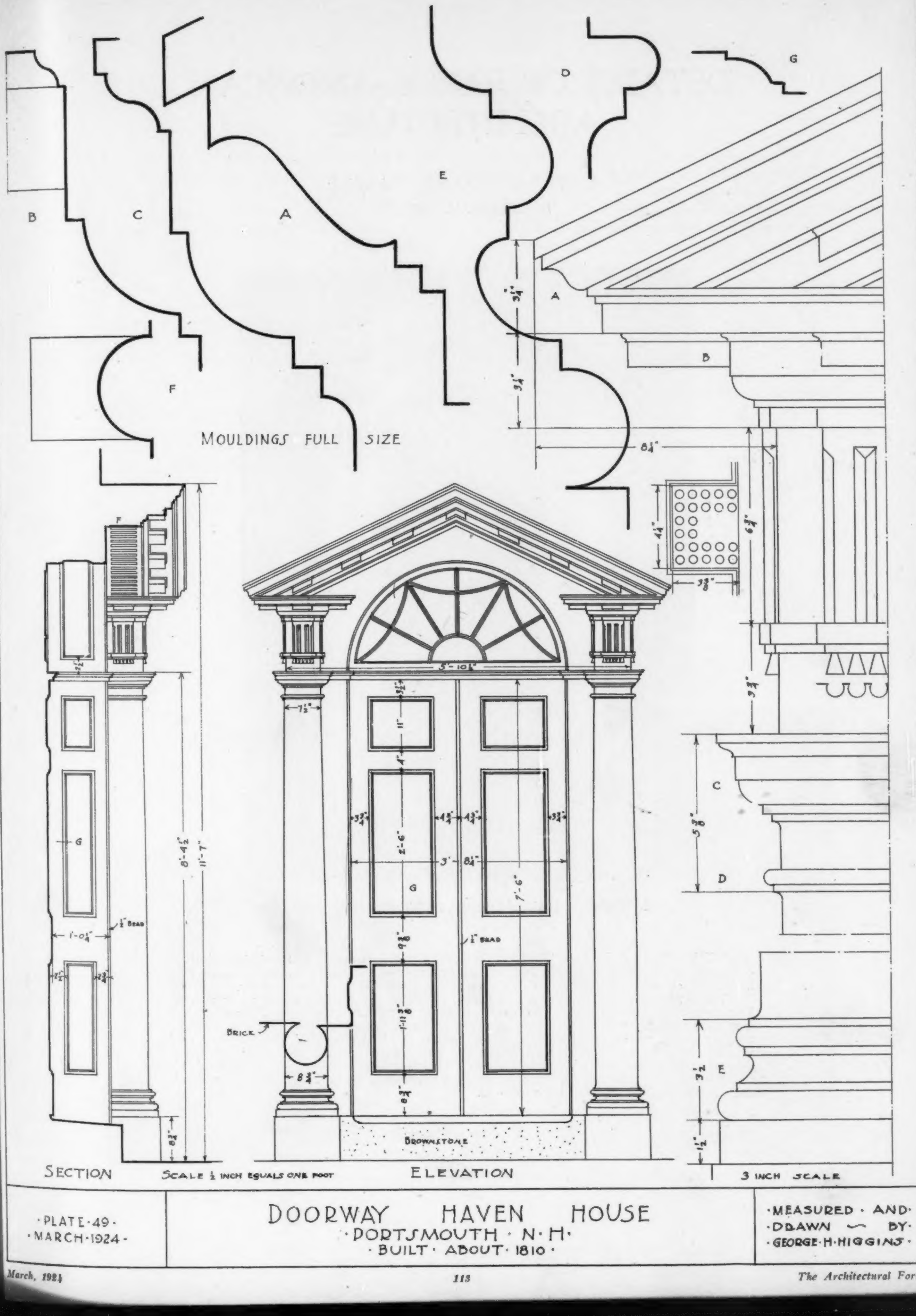
LIBRARY ENTRANCE

PORTSMOUTH · N·H

CHARLES BULFINCH ARCHITECT

BUILT 1806

·MEASURED· AND·
·DRAWN · BY·
·GEORGE·H·HIGGINS·



·PLATE·49·
·MARCH·1924·

DOORWAY HAVEN HOUSE
·PORTSMOUTH · N·H·
·BUILT· ABOUT· 1810·

·MEASURED · AND·
·DRAWN ~ BY·
·GEORGE·H·HIGGINS·

DETAILS OF EARLY AMERICAN ARCHITECTURE

A SERIES OF MEASURED DRAWINGS

By GEORGE H. HIGGINS

DOORWAY, HAVEN HOUSE, PORTSMOUTH, N. H.

ARCHITECTS of the Colonial and early Federal periods excelled in the designing of their doorways. Ornament indeed was generally confined to use upon the cornice of a building and its main doorway, with the chief effort lavished upon the doorway.

The entrance to the Haven house is among the most interesting to be found even in Portsmouth, an old town which is rich in architecture of the earlier periods. Worked out in a scale appropriate for wood, the doorway is framed by a pediment which encloses the transom and by two engaged columns which support it. The transom is given a design which is one remove from the austerely simple, and the door is paneled with six panels in three sizes which Bulfinch apparently regarded with especial favor since it is used in much of his work. One minor but graceful detail is the continuing of the line between doorway and transom into the capitals of the columns.

A Majorcan Loggia Ceiling

By GORDON ALLEN

AMONG the thousands of American tourists returning each autumn from Europe you will find few who have visited Spain, fewer who have been to the Balearic Islands, and not many who know more than vaguely where they are. A comfortable night's journey on the cleanest boats in the Mediterranean takes you from Barcelona to Palma, the capital of Majorca, the largest of the three islands and one of the most interesting towns of Spain, with a magnificent Gothic cathedral, any number of palaces of the fifteenth, sixteenth and seventeenth centuries, and on the mountain slopes outside the town many delightful villas in settings such as you associate with Sicily, Sorrento or Capri.

The palaces in Palma are none of them very large, but every room contains something of delight—a set of leather covered Spanish chairs, a fifteenth century tapestry, a kitchen floor and wainscot of the most charming colored tiles in the world, or, as in one case at least, a complete *vernis Martin* dressing table with mirror and innumerable boxes and brushes to match, all exquisitely designed to suit the vanity of some eighteenth century Spanish beauty.

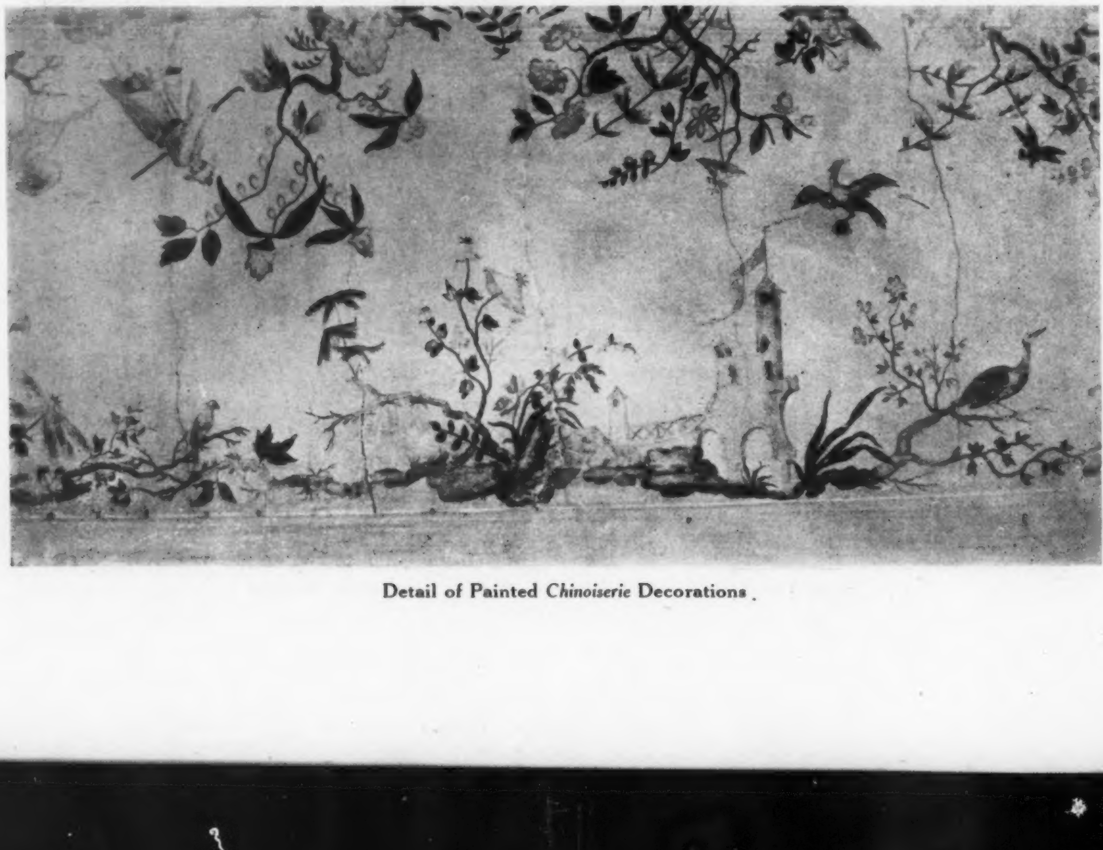
Perhaps the finest of the Palma palaces is the Casa del Marques de Sollerich, facing on a wide street which forms the principal boulevard of the town, where every evening in fine weather the *paseo* or promenade takes place, and, as in every Spanish town, eligible young ladies with their mothers or *duennas* stroll up and down for an hour or two, greeting their friends with a sedate bow and a flash of dark eyes from under their black lace mantillas. Overlooking this wide street, on what we should call the second story of the house, and opening out from the imposing drawing room, is a delicate loggia of five arches with slender columns of warm yellow marble reaching to the floor, and curved iron balconies of the Louis XV period, from which are hung on *festas* the most gorgeous crimson and magenta brocades. The eighteenth century decorated ceiling of this loggia is one of the most delightful examples of *Chinoiserie* to be found anywhere, and certainly the most important—if such a word may be used for so airy and fanciful a decoration—in Spain. It has the whimsical charm of the old toiles de Jouy, or other eighteenth century French designs for printed cottons, together with the imaginative quality of the panels in the *Singerie* at Chantilly, or the famous screen in the Musee Jacquemart-Andre in Paris. It is entirely "free design"—that is, there is no pattern or repetition, and except that the composition is extremely studied and balanced, there is no regularity whatever.

It is not a *soffito* design, in the sense that one is supposed to be looking up at sky or architectural features shown in perspective, as in the ceilings of Tiepolo or Michaelangelo; each border line is treated formally as a horizon, so that to study the four sides separately one has to assume four different positions. The background is a warm gray, the color of the

Street Facade of Casa del Marques de Sollerich, Palma, Majorca


Opposite Ends of Painted *Chinoiserie* Decorations on Loggia Ceiling
Casa del Marques de Sollerich, Palma, Majorca

plaster; on each side are painted, gnarled trees, birds, and Chinamen in various postures, with one or two bits of Chinese architecture, or at any rate the eighteenth century European conception of it. The colors are few and simple—a clear but dull green, burnt siena, and a red like that of Chinese lacquer but somewhat less brilliant—all on the quiet gray background of the plaster "sky." With all its freedom of treatment it is not restless in the least, and nothing I can imagine could be more pleasant than to lie in a long Chinese chair on such a loggia and to lift one's eyes from a book to such a ceiling!



Detail of Painted *Chinoiserie* Decorations

DECORATION & FURNITURE

Interior Details from Hotel Gouthiere, Paris

EXAMPLES OF THE PERFECTION OF LATE LOUIS SEIZE DECORATION

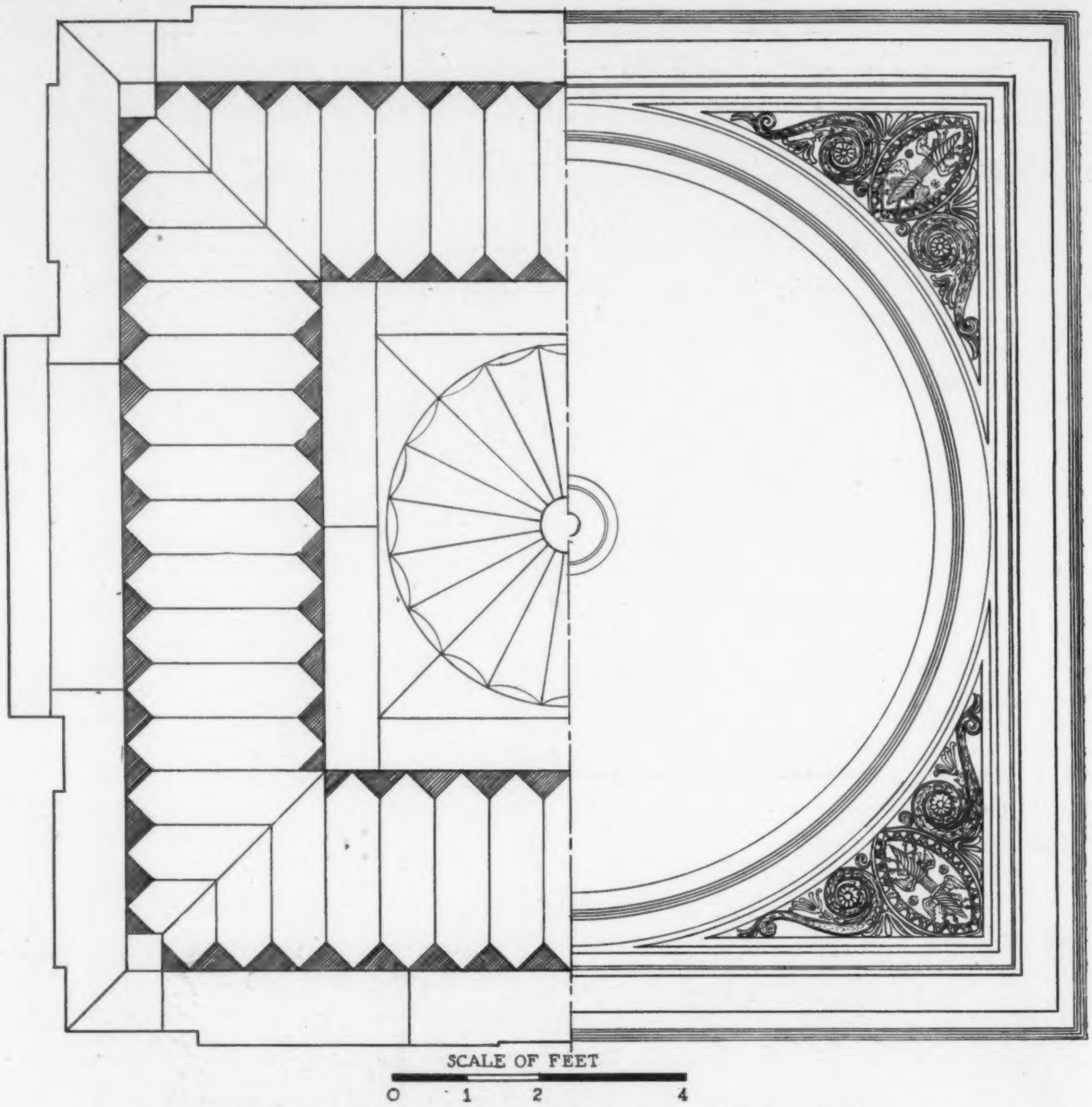
AT No. 9 Rue Pierre-Bullet in Paris, originally a street of exclusive residences, long since abandoned to small tradesmen, still stands the exquisite little hotel built during the latter part of the reign of Louis XVI by the famous craftsman Pierre Gouthiere. Together with Boule, the name of Gouthiere has come down in the history of French decoration as that of a consummate artist in his craft, endowed with an innate appreciation and understanding of the masters in metal of the Italian Renaissance, whom he equaled in beauty of design and skill of execution.

This artist enjoyed great prosperity and popularity under the patronage of Louis XVI and his luxurious court and the effete aristocracy before the Revolution. His decorative sculptures and designs in gold and bronze and brass, used so extensively to embellish household utensils, furniture and woodwork of the Louis Seize period, placed him among the foremost artists of his day. His genius, employed by such arbiters of exacting taste as the Duke d'Aumont and Madame Du Barry, was allowed but a brief opportunity to shine. Like many of the artists, designers and craftsmen, who through the patronage of king and court built up in France to a point of perfection and beauty never equaled before or since all branches of the arts and crafts, Gouthiere was overwhelmed in the anguish of the Revolution.

Already ruined through his failure in 1784, and unable to collect his bills against his former aristocratic patrons, now dead or scattered, Gouthiere was abandoned to the partisans of a democratic decorative style. Suspected perhaps as a follower of the Bourbons, out of sympathy with the stiff, dry, prescribed ornament which the new regime of civilian

Photo by Giraudon

Small Salon, Hotel Gouthiere, Paris



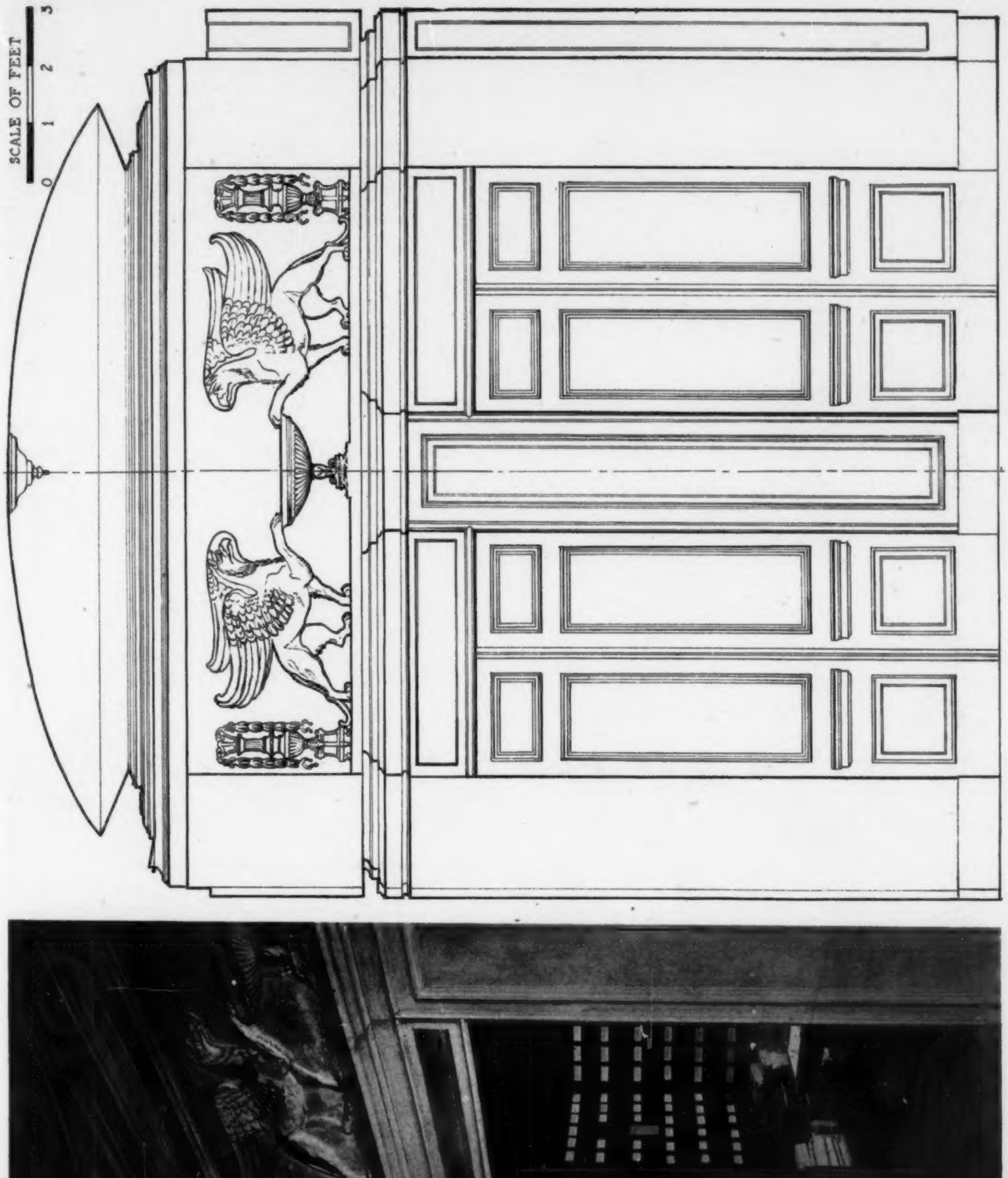
Half Plan of Floor and Ceiling, Vestibuie of Hotel Gouthiere, Paris
Measured Drawing by a Student of Paris Atelier, New York School of Fine and Applied Arts

government demanded, Gouthiere disappeared from sight. He was ignored. Paris, formerly so proud of him, forgot him, and when he died in 1813 it was in a common grave she buried him, as a man unknown and unhonored. Time, however, makes amends. The genius of Gouthiere is once again recognized and acknowledged.

The street facade contains one high story and an attic. The stonework of this main story is rusticated, and crowned, as is the attic, with a cornice of much refinement and delicacy. An entrance pavilion, flanked by two bays which project from the main building toward the street, occupies the center of the design. These bays form an open court, which is largely filled by unusually broad terraced steps leading from the entrance door down to the street. Heavy pedestals surmounted by recumbent sphinxes flank the upper tier of these splendid steps. An imposing entrance door, with bracketed entablature and fine mouldings, set into a deep archway, is the only opening in the rusticated wall of the center bay. Resting on the entablature of the door and filling the arched space above it, two seated female figures suggesting Music and Poetry hold a wreath above the head of a bust representing the Goddess of Art. Set into the attic above the arched doorway of the center pavilion is an oblong panel of sculptured cupids depicting the triumph of Love. Some bear fruit, some flowers and some musical instruments; cupids dance through the entire design, surrounding the Queen of Love shown in a tiny flower-bedecked chariot drawn by two lambs.

DETAIL OF ROOM FINISH

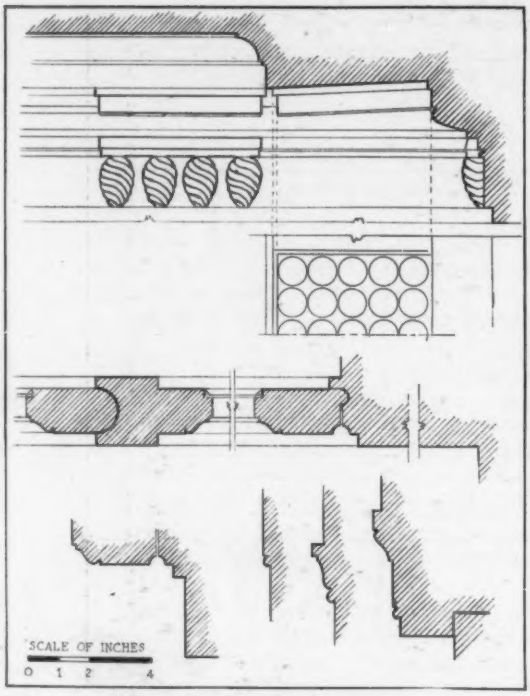
Photo by Giraudon



ELEVATION OF SIDE WALL

VESTIBULE OF HOTEL GOUTHIERE, PARIS

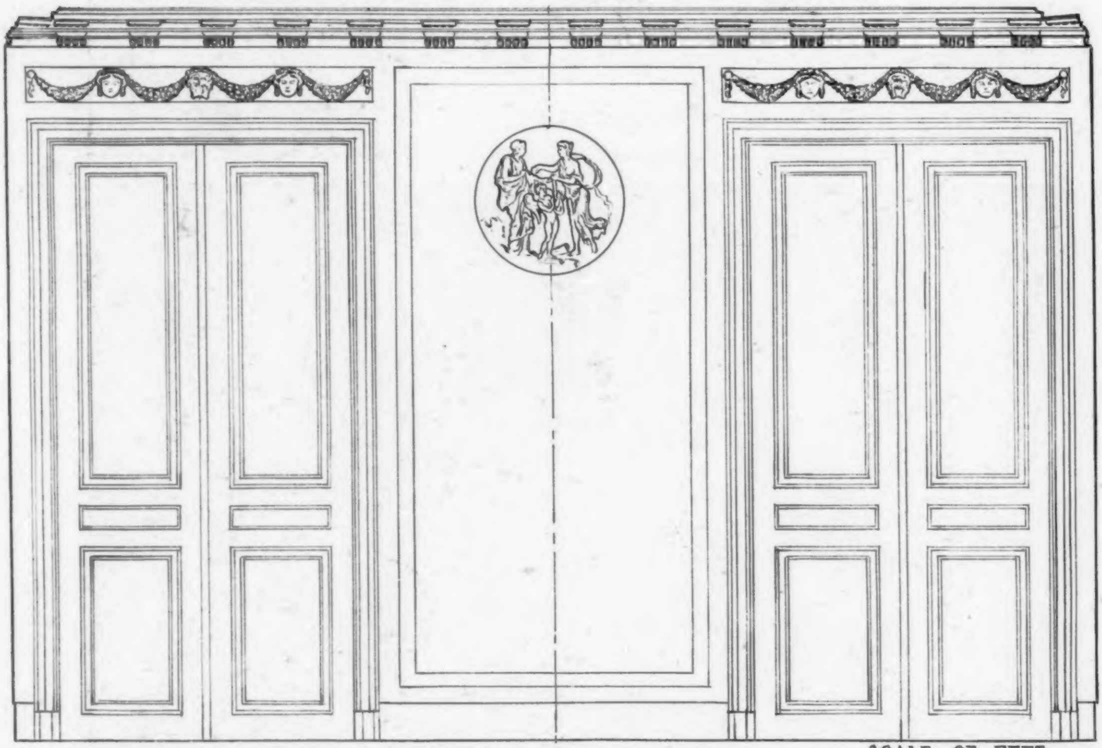
MEASURED DRAWING BY A STUDENT OF PARIS ATELIER, NEW YORK SCHOOL OF FINE AND APPLIED ARTS



Details of Cornice and Mouldings
Small Salon of Hotel Gouthiere, Paris

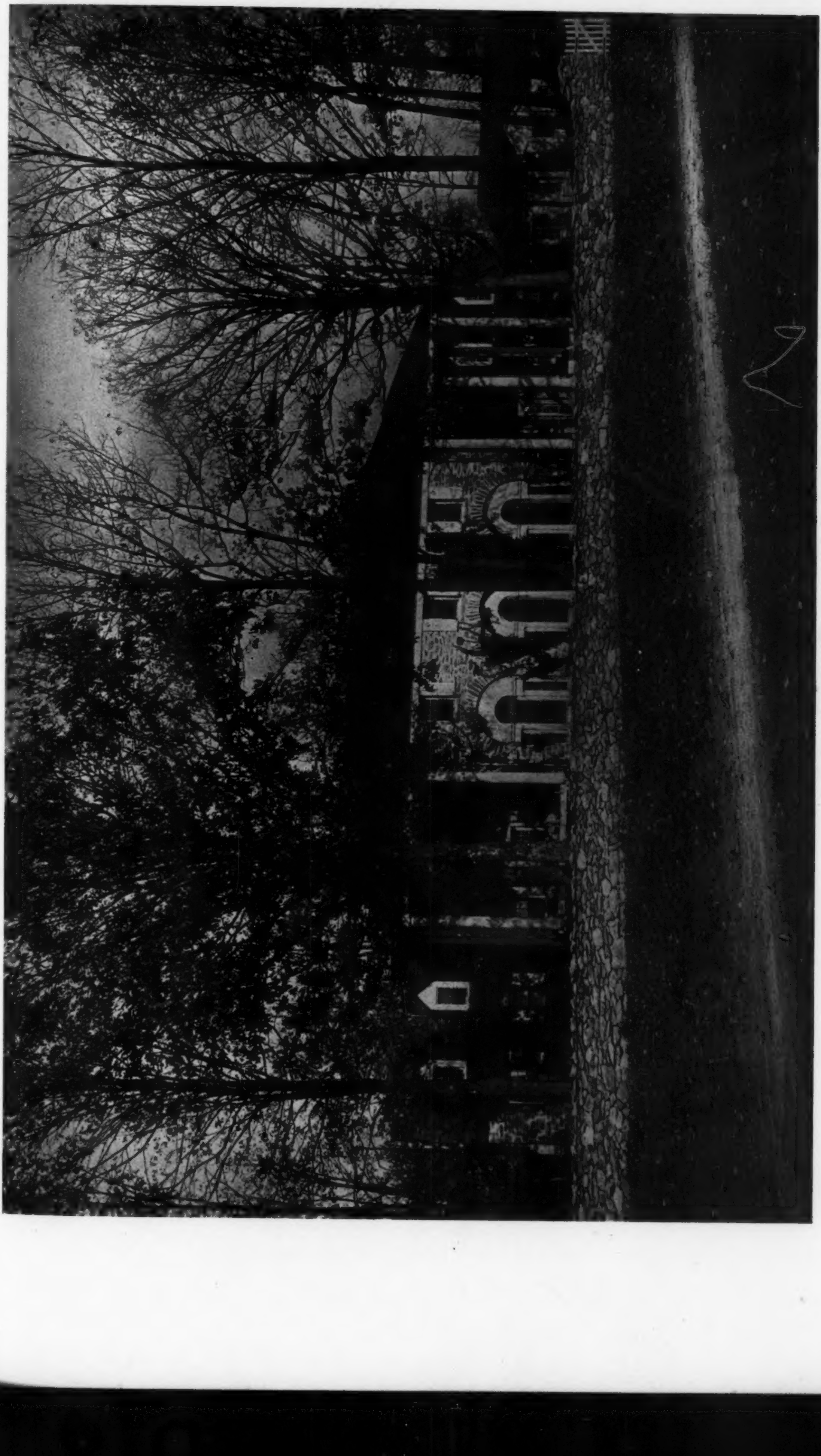
The care displayed in the scale of the exterior details is found again upon entering this house, as may be seen in the accompanying illustrations and drawings of the vestibule and small salon. In the vestibule the low relief and the carefully studied proportions of the pilasters and panels, as well as the fineness of the cap and cornice mouldings, are characteristic of the late Louis Seize period. The salon shows the same delicacy of treatment in door and wall panels and mouldings. The low cornice of this room with its mutules and guttæ is indicative of classic influence. The sizes of these rooms and the small scale of the various decorations and details are easily adaptable to modern use.

Unfortunately the illustrations give no idea of the color used in these interiors. In the salon, for example, the base is dull red marble, the walls and trim are painted rich yellow, the doors gray-green, the ceiling soft cream, and the floor is finished brown. From this brief description it is possible to visualize the glowing warmth of color displayed in this small room. With such a precedent to follow, a freer use of strong color in the interior decoration of American houses might well be employed. It is the combination of delightful color with well placed decorations and carefully studied details which gives to these rooms a unique value to students of architecture and decoration as a useful object lesson.



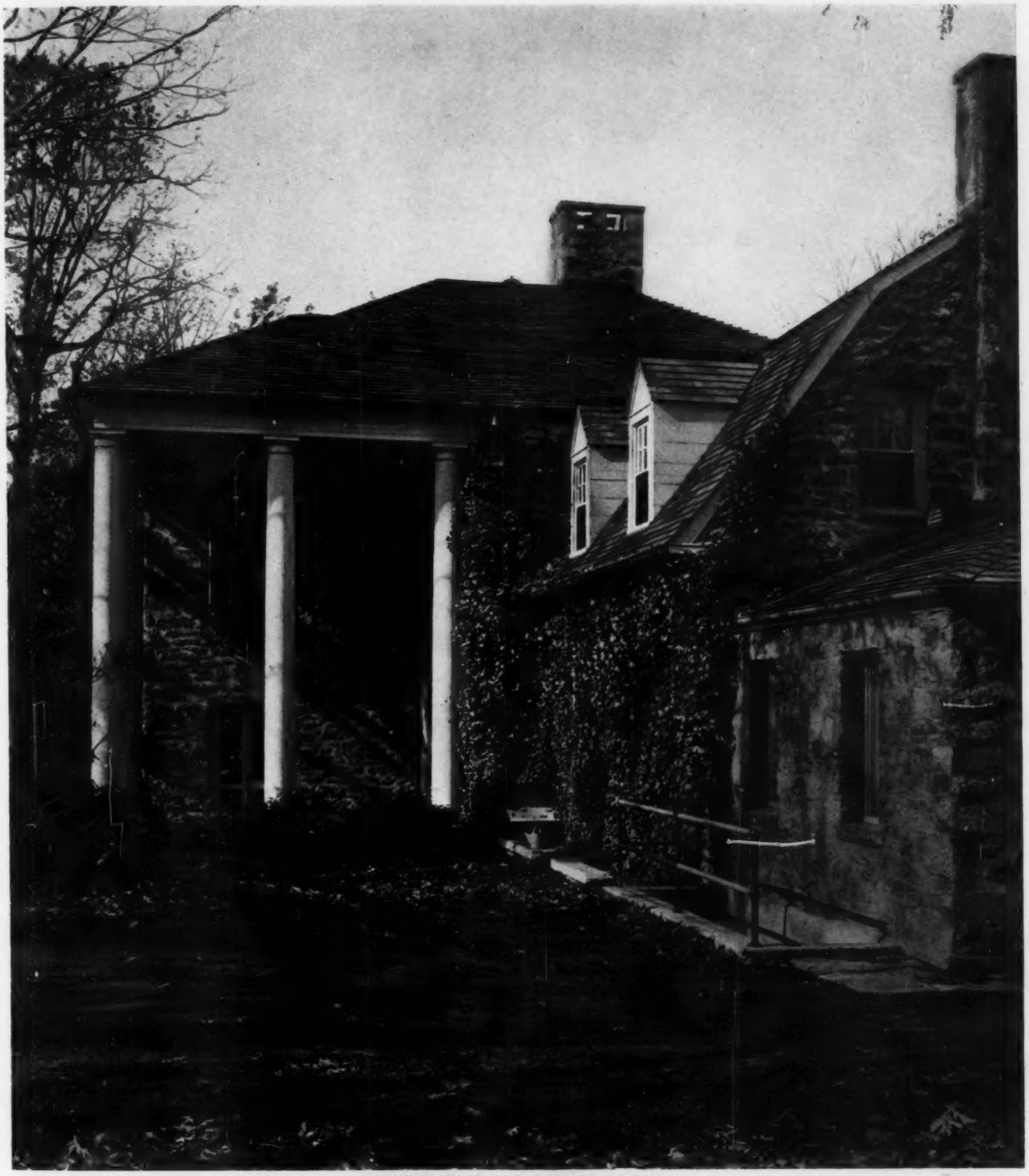
Elevation of Side Wall
Small Salon of Hotel Gouthiere, Paris

Measured Drawing by a Student of Paris Atelier, New York School of Fine and Applied Arts

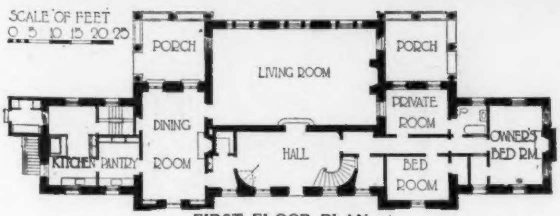


LIVING FRONT OF HOUSE, FACING PASTURE
"GOODESTONE," HOUSE AT MIDDLEBURG, VA.
GOODWIN, BULLARD & WOOLSEY, ARCHITECTS

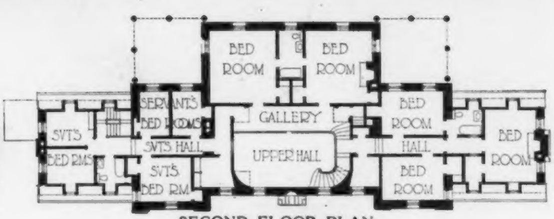
Photos, Schuyler Carteret Lee



SERVICE WING AND CORNER PORCH



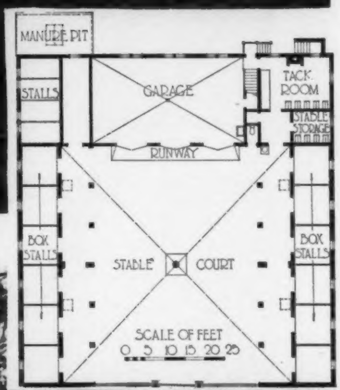
FIRST FLOOR PLAN



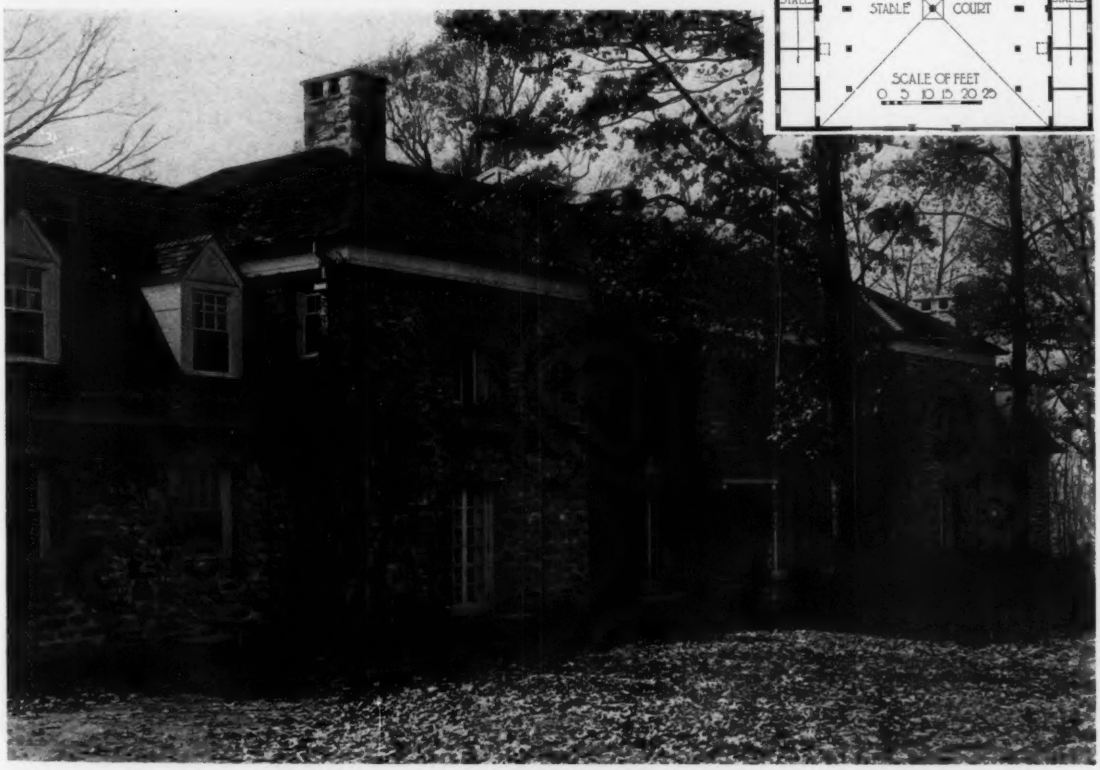
SECOND FLOOR PLAN

"GOODESTONE," HOUSE AT MIDDLEBURG, VA.

GOODWIN, BULLARD & WOOLSEY, ARCHITECTS



GENERAL VIEW OF STABLE AND FLOOR PLAN



ENTRANCE FRONT OF HOUSE

"GOODESTONE," HOUSE AT MIDDLEBURG, VA.

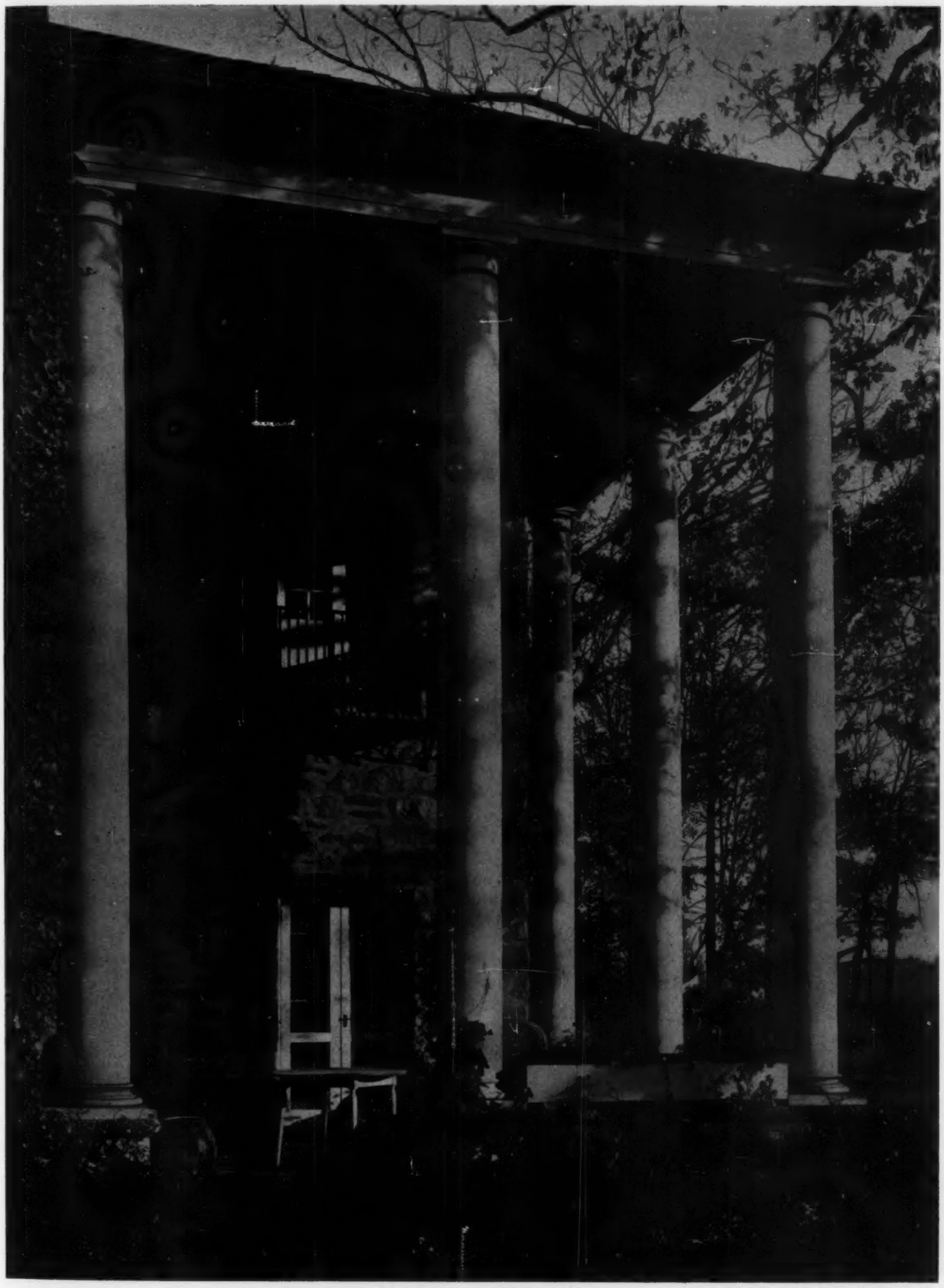
GOODWIN, BULLARD & WOOLSEY, ARCHITECTS

DETAIL OF LIVING ROOM WINDOW

DETAIL OF LIVING SIDE OF HOUSE

"GOODESTONE," HOUSE AT MIDDLEBURG, VA.

GOODWIN, BULLARD & WOOLSEY, ARCHITECTS



DETAIL OF CORNER PORCH
"GOODESTONE," HOUSE AT MIDDLEBURG, VA.
GOODWIN, BULLARD & WOOLSEY, ARCHITECTS

LIVING ROOM
"GOODESTONE," HOUSE AT MIDDLEBURG, VA.
GOODWIN, BULLARD & WOOLSEY, ARCHITECTS

Picturesque New York

By GREVILLE RICKARD
With Illustrations by the Author

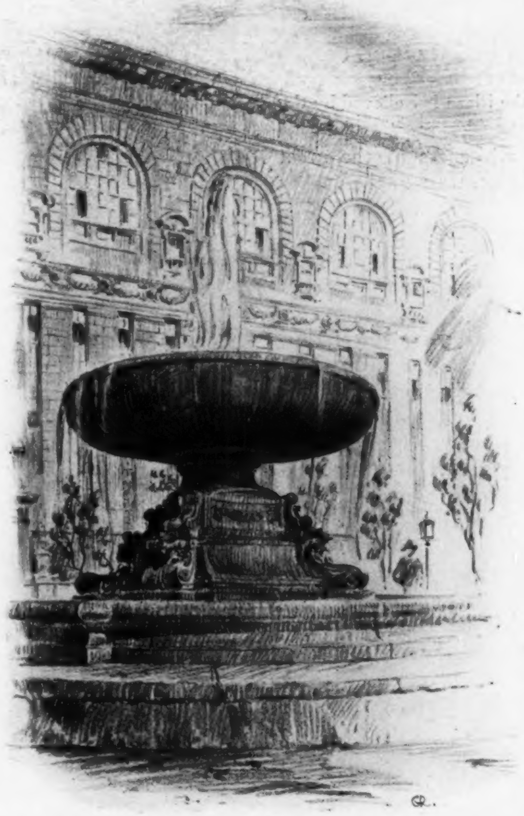
IN considering the question of what is picturesque in New York, one is likely to become somewhat bewildered in gathering together many impressions. One is apt to ask the question—"Can New York as a whole or only in part be justly termed beautiful?"

If one were to ask this question of the average New Yorker, there would be in his answer some hesitation. The inevitable comparison with other great cities of acknowledged magnificence and beauty would come to his mind,—such cities as Paris and Washington. Although the New Yorker might feel justified in boasting of his glorious "home town," it is conceivable that he would be obliged to admit that New York under ordinary conditions is not a beautiful city. It lacks the necessary qualifications of consistency and uniformity. It has been built with little thought for æsthetic results. It has not as a whole the beauty that is expected of a great city. Take Paris as an example. Paris has its open squares and parks, its beautiful vistas, its fountains and monuments, and its incomparable river Seine. All parts of Paris reflect the spirit of an artistic and aspiring people. New York, too, has its open squares and parks, its vistas and monuments, and its rivers. Its squares for the most part lack architectural symmetry. The scattered trees and wandering walks make little appeal to the artistic sense. Aimless in plan, its squares serve as a sanctuary for uninteresting fountains and monotonous monuments. Most of the monuments are meaningless in location and mediocre in merit. Its rivers are no longer beautiful. Commercial materialism has desecrated their several shorefronts. But in spite of all the ugliness in New York there still lingers a quality of the picturesque in some of the streets and squares, and the wharves from which the masts of the square-riggers have long since disappeared. From the rivers themselves may be seen the fascinating and inspiring skyline of the city. Although like a seismographic chart this skyline, this architectural contour of New York is too restless to have real beauty it does possess an inspiring and picturesque grandeur.

The accompanying sketches were made for the most part in the neighborhood of the plaza and Fifth Avenue below Central Park. The picturesque quality of this part of the city is distinctive. It possesses a dignity and spaciousness that are lacking in lower New York. From many points of view this artist has seen and felt its charm. It has sufficiently aroused his artistic sense to give him an irresistible desire to record in sketches some of these fleeting impressions.

In one sketch he has shown the splendid Gothic entrance of St. Thomas' Church, a great piece of architecture, capable of producing sensations of real emotion. Not only is it beautiful in its finely detailed carving and in its stone of varied coloring, but it is especially beautiful in the proportion of its masses. The severity of its plain walls pleasantly offsets the exquisite lacework of its carving. The fine rose window above the entrance rivals in its tracery the most beautiful examples in the old world. In another sketch, farther up the avenue, he has brought out the strong outline of the dark brown Fifth Avenue Presbyterian Church, set off in sharp silhouette against the light colored mass of the Heckscher Building.

The plaza has a quality of picturesqueness all its own, of which he has given one impression. In the foreground the soft gray stone of the Pulitzer fountain, with its terraced basins surmounted by the bronze figure of Abundance with her panier of fruits, stands out in bold relief against the warm red mass of Mrs. Vanderbilt's brick chateau. Behind and above tower the buff colored walls of the picturesque Heckscher Building. There are interesting views of the Plaza to be had from any of the adjacent side streets. As seen in another of the



The Beauty of Rome is Recalled in the Massive Fountain on the Western Terrace of the Public Library

The Towering Architecture of the Plaza Is Relieved by the Charming Contour of the Pulitzer Fountain

accompanying sketches, the whiteness of the great hotel stands out in interesting contrast to the darker buildings at the south.

The terrace fountain designed by Charles A. Platt, which overlooks Bryant Park, just west of the Public Library has been taken as the subject for another sketch. There is a certain peaceful quiet about this oasis in the noisy, rushing, confusing turmoil of New York's center. A little of the feeling of seclusion, "far from the madding crowd," has been caught in this sketch of the fountain silhouetted against the west facade of the library. The towering pavilions of the new Fraternity Club House designed by Murgatroyd & Ogden, as seen from Madison Avenue below 34th Street, have furnished the inspiration for still another drawing. This building is a recent example of the setback type of design developed by the requirements of the new zoning law. The benefits derived from this law have far surpassed the expectations or even the intentions of its framers. The benefits hoped and planned for were of a material, not of an æsthetic nature, yet the results have proved to be responsible for quite as much improvement in the architectural aspect of the city as in the material comfort of the citizens.

Is not the beauty of Paris largely attributable to the uniformity of building heights and similarity of architectural styles? New York can hardly hope for a similarity of architectural styles to be established by law. The keynote of our American civilization has always been the freedom of individual expression. Therefore it is only natural that our architecture should likewise express every conceivable variety of individual taste, good, bad and indifferent, side by side, buildings large and small, tall and low, buildings of brick or stone, of marble or terra cotta. For the first time in the history of building in New York we have at last one law, which will bring uniformity to city architecture in one respect at least. We shall eventually have a symmetry in our street facades through the uniformity of cornice heights. Already one can see in many directions buildings of the new type. The sheer and ungainly rise of flat walls from base course to cornice line has been replaced by a logical piling up of well proportioned masses of walls and windows which break the

The Buildings on 58th Street Stand Out in Sharp Silhouette Against the White Walls of the Great Hotel

skyline with a pleasing silhouette of sloping roofs or towers, doing much to create harmony.

There are other buildings, erected before the "set-back" law went into effect, which are topped with gracefully pitched roofs presenting a balanced and completed silhouette against the sky. One of the most pleasing is the Bush Terminal Building on West 42nd Street, designed by Helmle & Corbett. Some think that it has no equal in the city for pure beauty and grace of outline as it rises tower-like into the sky. See it from the west when the sunset fades into twilight, and the detail is lost in shadow; then one is impressed by the dreamlike quality it possesses. It seems like a picture-castle from the Arabian Nights rather than a practical commercial building of this material world. It inspired one of William Walcott's delightful etchings.

Another interesting example of the new type of tall building is the Shelton Hotel at Lexington Avenue and 49th Street designed by Arthur Loomis Harmon. This building, like the Bush Terminal on

Buildings Large and Small, Tall and Low, Light and Dark Give Variety to the Dignity of Fifth Avenue

The Massed Towers and Pavilions of the Fraternity Club Rise Grandly above the Low Roofs of Madison Avenue

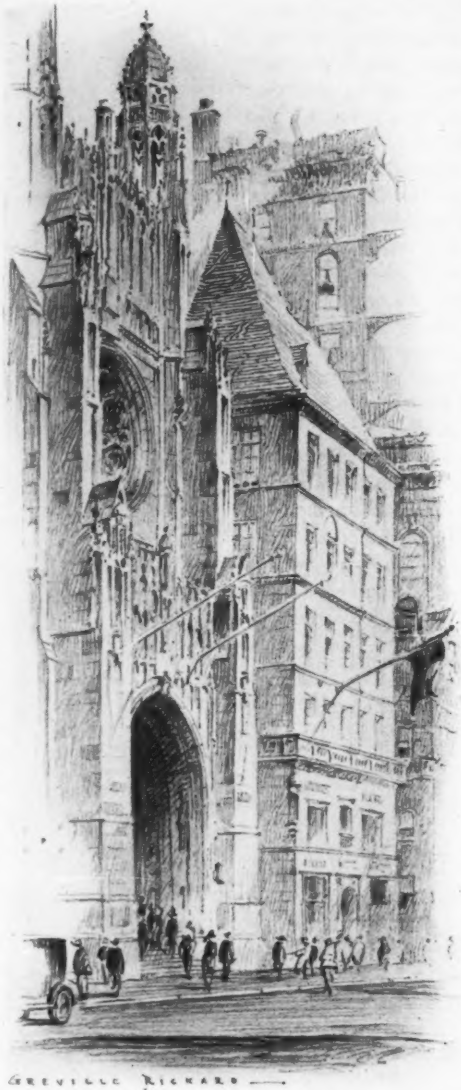
42nd Street, sometimes produces the feeling of dreamlike unreality, especially against an evening sky. It gives the impression of being some gigantic stage-set for "Robin Hood." One wonders if three other sides to the building actually exist. This sensation is produced by the extreme thinness of the window reveals and the flatness of the walls.

Although New York as a whole may be lacking in beauty, one must grant that it possesses beautiful examples of modern architecture as well as picturesque vistas and views of real artistic value. A beautiful building or an enchanting view awakens one for the moment from materialism and helps one to forget the turmoil and struggle of city life. Only gradually does one realize the enchantment of the city's varying moods and expressions, revealed according to the changing hours and weather.

In the early hours of the day New York looms up in the veil of morning mist. Later, in the transparent atmosphere of perhaps a mid-day in June, when bright colored flags and banners give an added brilliance to the streets. And again when the rays

of the setting sun bathe the tops of the buildings in an orange glow, and leave their bulk obscured by the shadows of approaching night, or when in the waning day the mantle of twilight softens with shadows the sharp silhouettes, and melts into purpled gray the details of the great massed buildings. Finally comes the yellow light of the street lamps to crowd out the twilight and flood the pavements with molten gold. At such times New York is truly beautiful, truly full of mystery and magic, poetry and romance. To the eye that can see, this city has, in parts at least, a quality of picturesqueness hardly surpassed in any other city in the world. A picturesqueness of infinite variety.

Starting from the Battery and journeying northward to Central Park, one is continually impressed by the recurring picturesqueness of New York,—the Battery with its open park, its quaint old Castle Garden, its vista up the canyon of lower Broadway, its municipal ferry building and the low brick arcade of the harbor master, facing across the narrow meeting of the rivers toward old Fort William and the barracks on Governor's Island, its wide walk along the riverfront, where the broad waters of the upper bay lead the eye off to the Statue of Liberty, the low towers and roofs of Ellis Island and the blue hills of distant Staten Island. The very mention of each one of these corners of the Battery brings to the mind a scene of delightful picturesqueness.



The Splendid Gothic Facade of St. Thomas' Produces Religious Emotions

Bowling Green, the ancient churchyards of Trinity and St. Paul's, and the open park at City Hall, give an old world touch to lower Broadway. Union Square, where the Washington statue stands out in solitary relief against the old buildings of lower Fourth Avenue, and Washington Square, where the marble arch and red brick houses preserve the spirit of Revolutionary days, all impress one with their artistic charm. The same is true of St. Mark's Church at the head of the famous old Bowery, if one will stop for a moment in the quiet seclusion of its portico, and of St. George's at Stuyvesant Square, if one will sit for a while in the cool shadow of its twin towers; Gramercy Park, with its high iron railings, its gravel paths and its axial memorial to Edwin Booth, still retaining the seclusive dignity of a small square in London; and a few blocks north where Madison Square, breaking the monotony of Broadway's older shops and lofts, gives a number of picturesque compositions, such as Paul Cornoyer and Childe Hassam loved to paint; the obelisk guarding the grave of General Worth, sentinel at the entrance to upper Fifth Avenue; the graceful tower and shadowy arcades of the Garden, seen through the few remaining trees of the old square. The Roman portico and low dome of Stanford White's Madison Square Church are missed from where they used to stand under the shadow of the lofty white clock tower. On Madison Avenue at 36th Street the perfect proportions and refinement of detail which Mc Kim perpetuated for all time in that architectural jewel, the Morgan Library, suggest the Renaissance of Italy. At 42nd Street, Carrere & Hastings recall in the Public Library the architecture of the French school of fine arts.

Fifth Avenue although not beautiful is impressive. Here every conceivable style of architecture has been employed in the unrelated facades of the motley array of buildings. St. Patrick's Cathedral is imposing. The Gorham and the Tiffany Buildings and the University Club are fine examples of the "grand style" of McKim, Mead & White. St. Thomas' Church by Cram, Goodhue & Ferguson, the stone chateau of the Vanderbilts at 52nd Street, the older house by Richard M. Hunt and the newer house by Stanford White, all lend added dignity and distinction. A pilgrimage filled with changing colors and varied impressions. History and romance have shadowed one's footsteps; the history of the material growth of a great city, the romance of the artistic development of a new people expressed in the city itself.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

The Use of Hydrated Lime With Portland Cement

By JOHN W. RAMSEY

ALTHOUGH it is not commonly known, there are two kinds of lime; one is high calcium, and the other magnesia or dolomite. When you buy hydrated lime, you buy, of course, some water, and all you get that is of value is available oxide, and it is necessary for the user to look at the bag and see whether he is buying 28 per cent of water or 18, or 70 or 80 per cent oxides.

Another point to remember is the fact that analysis is not the whole story. Lime is shipped from Maine to Illinois, passing en route several lime plants making the same kind of lime, as shown by analysis. Also, lime has been shipped for years from Pennsylvania to northern Maine. The buyers of these limes are not foolish, but for their particular purposes, the lime they buy gives them the results they desire and which other limes will not.

An instance about twenty years ago within the knowledge of the writer was the purchase by a manufacturing concern of hydrated lime which happened to contain 18 per cent water and 32 magnesia. The chemist for the mill condemned the material and declared 50 per cent of the hydrate was worthless and cost more money than lump lime, pound for pound, and that twice as much hydrate as lump lime would have to be used to get the same results. The chemist was asked to prove his theory by actual test, and he was surprised to find that he had made an error when the hydrate proved to do pound for pound what the lump lime would do, and the hydrate had the added advantages of being cleaner, subject to no slacking, and causing no increase in insurance rates in the buildings where it was stored.

About 1907 one prominent New England railroad tested out hydrated lime with these results:

Mixture	Tensile 7 days	Strength 28 days	Quantity of water passing through 10 min. 7 days 10-lb. press.	7 days 20-lb. press.	7 days 30-lb. press.	28 days 10-lb. press.	28 days 20-lb. press.	28 days 30-lb. press.
Sand .... 900 pts. Cement .... 300 "	200	250	30cc.	45cc.	65cc.	25cc.	30cc.	28cc.
Sand .... 900 " Hydrated lime .... 15 " Cement .... 285 "	175	255	50cc.	70cc.	80cc.	18cc.	30cc.	32cc.
Sand .... 900 " Hydrated lime .... 60 " Cement .... 240 "	120	200	15cc.	40cc.	50cc.	5cc.	10cc.	10cc.
Sand .... 900 " Hydrated lime .... 90 " Cement .... 210 "	110	160	5cc.	7cc.	10cc.	0cc.	1cc.	3cc.

Of course, hydrate was not so well known in 1907 as it is now, but these tests check up closely with the results of tests issued recently, as shown here and given in Bulletin 303 of the National Lime Association, which is easily to be had upon request from any of its offices.

Series No. 5. 1:3 Portland cement and sand, working consistency.

Series No. 6. Same with 2.5% of hydrated lime added.

Series No. 7. Same with 5.0% of hydrated lime added.

Series No. 8. Same with 7.5% of hydrated lime added.

Series No. 9. Same with 10.0% of hydrated lime added.

Storage Methods:

(a) Under water in tank in laboratory.

(b) In open air in laboratory.

(c) Outdoors, exposed to all weather, March 1 to April 15, 1916.

(d) In laboratory, alternating one week in water and one in air.

(e) Buried in moist, clayey soil.

Series	Storage	Tensile strength in lbs. per sq. in. 7 days	14 days	21 days	28 days
	a	156	199	240	270
	b	142	171	189	150
5	c	103	98	156	141
	d	154	259	223	326
	e	122	166	208	223
	a	172	201	235	274
	b	115	98	146	130
6	c	86	95	139	148
	d	157	247	208	335
	e	118	189	220	239
	a	191	228	275	299
	b	148	132	156	154

Series	Storage	Tensile strength in lbs. per sq. in. 7 days	14 days	21 days	28 days
7	c	110	162	145	169
	d	203	312	249	386
	e	156	230	274	300
	a	169	218	250	274
	b	139	166	159	166
8	c	107	158	158	189
	d	162	321	233	310
	e	138	213	239	285
	a	201	249	271	299
	b	154	169	181	208
9	c	141	148	188	271
	d	189	314	273	408
	e	168	228	279	305

Watertightness: These tests were made by Sanford E. Thompson, Boston.

Concrete of 1:2:4 mixture, hydrated lime added; specimens were 4 inches thick, water pressure was 80 pounds per square inch.

Percentage of hydrated lime	Flow in grams per minute At 14 days	At 21 days	At 28 days
0.0	5.52	2.92	1.91
2.0	9.20	2.55	1.63
4.0	2.82	1.49	.76

In another series of tests by Mr. Thompson, the specimens were concrete cubes in which iron pipes were imbedded, through which the water pressure could be applied. The results were thus given:

Per cent hydrated lime	Age in d.	Flow under 7-ft. head: Duration of measured flow in hours	Flow in grams per hour	Age in days	Flow under pressure of 60 pounds per sq. in.: Press. apl'd before measure in hrs.	Duration of measured flow in hours	Flow in grams per hour
1:2:4 Concrete							
1	18	161	2.7	40	24	4¼	74.8
4	18	161	1.2	41	18	5	28.4
7	18	161	1.0	42	, 18	6¾	5.2
10	15	161	1.0	46	6	18	1.6
1:2.5:4.5 Concrete							
0	30	169	1.9	45	18	6	32.5
10	29	169	0.8	49	..	11	0.0
14	29	169	0.7	50	..	27	0.0
1:3:5 Concrete							
0	26	169	9.8	50	6	14	70.6
8	26	169	1.1	51	8	17	3.6
14	28	169	1.1	50	28	13	10.7
20	28	169	1.2	53	9	15	0.7

In connection with these tests Mr. Thompson in an address delivered before the American Society for Testing Materials said: "The cost of large waterproof concrete structures frequently may be reduced by employing leaner proportions of concrete with hydrated lime admixtures, and small structures, such as tanks, may be made more watertight. Although the character of the sand and stone used in the concrete will affect the best percentage of lime to use, the present materials are representative of average materials throughout the country, so that the results should be of general application. Coarser sand would naturally require slightly larger percentages of lime, and finer sand (that is sands having a larger percentage of fine grains, which pass a sieve with 40 meshes to the linear inch) would be likely to require less lime since sands containing considerable fine material produce a more nearly watertight concrete." His experience proves this, after experiments covering a number of years.

In addition to this we find some good data in this same Bulletin on the "Effect of Sea Water." A test to determine the effect of adding hydrated lime to concrete mixed with sea water was made by the Dravo Construction Company at Sparrows Point, Md. Blocks were 4 x 6 x 12 inches. The mixture was 1:2:4. The sand and gravel both were soaked by rain. The hydrated lime was added to the extent of 10 per cent of the cement content, by weight.

Block No.	Mixed with	Stored in	Age in days	Total load in pounds	Ultimate strength lbs. per sq. in.	Per cent of lime
1	F. W.	air	8	972.4	138	0
2	F. W.	air	9	864.1	122	10
3	F. W.	water	9	1405.6	198	10
4	S. W.	air	8	852.7	120	0
5	S. W.	air	9	892.6	126	10
6	S. W.	water	9	1434.1	202	10

The specimens were all tested and broken as beams with the 4-inch dimension vertical, and maximum possible span.

Expansion and Contraction Due to Weather and Moisture

An exhaustive series of tests to determine the effect produced by adding hydrated lime to mortars and concrete in connection with the changes in volume caused by varying weather and moisture conditions was made by the Henry M. Spackman Engineering Company, these tests having proved to be of great interest and value.

The mortar specimens were 3 feet, 3 inches long and 4 inches square. The basic mixtures were 1:3 and 1:4 to which were added various percentages of hydrated lime and in some of which hydrated lime was substituted for Portland cement in various percentages. The concrete specimens were 6 feet, 6 inches long, 18 inches wide and 6 inches thick. The concrete specimens were placed in the ground out of doors with their tops flush with the surface. The mortar specimens were stored in various ways, in the laboratory under water and in the air; out of doors, and alternately in air and water. Measurements were taken with a specially designed steel micrometer reading to 1/100 mm. but not provided with temperature compensation. The readings were taken on copper plugs inserted in each end of each specimen. The initial reading was taken four hours after casting the specimen and was recorded as being the absolute length of the specimen. Readings were then taken at 24 and 48 hours, after which they were taken every week for a period of six months. To present figures giving the results of these tests would require more space than can here be devoted to them, in order to be of value. This quotation, however, is made from the summary of the report made by the Spackman Company. "The investigation as a whole, in our opinion, indicates that the addition of hydrated lime will be found advantageous under ordinary climatic conditions, not only in concrete road construction but in concrete work generally, where it is exposed either to air or to

fresh water, as concrete to which such additions have been made, besides being more impermeable will show less change in volume under varying moisture content."

Concrete in Salt Water

Investigation has proved that the prime requisite for the integrity and permanency of concrete in sea water is density. The use of hydrated lime has been very generally adopted in Europe for concrete marine structures, both floating and fixed. Hydrated lime has also been used with great success in several floating concrete structures in this country. One of the most interesting uses of hydrated lime in this country was in the construction of concrete oil barges by the Torcrete Shipbuilding Co. of New York. These barges carry oil in bulk, and so are exposed to the action of crude oil on the concrete inside, and the action of sea water on the outside.

Another interesting example is to be found in the plant of the Union Salt Works at Cleveland. This company uses concrete tanks 100 feet long, 8 feet wide, 2 feet deep and 4 inches thick to evaporate the brine, as pumped from the earth, by boiling the brine within the tanks. The product obtained by boiling is removed from the tanks in the form of salt sludge, which is placed in concrete tanks or drain bins, also containing hydrated lime, to be drained and dried. The concrete tanks and bins have given perfect satisfaction for over two years, after having been subjected to natural salt action which is much more severe than that encountered in natural sea water.

Dr. Wm. Michaelis has made perhaps the most intensive study of the action of sea water on concrete, and in reporting on his experiments used these words: "Under ordinary temperatures carbonate of lime cannot be decomposed by sulphates; hence the most extensive formation possible of calcium carbonate from an excess of hydrated lime will be the best possible protection."

Hydrated Lime for Waterproofing

In Bulletin 302 of the National Lime Association there is given some interesting information:

"There are certain technical and economic criteria which determine the degree of usefulness of every structural material, and the study of a large number of concrete structures, both in course of erection and during years of service, has shown that a waterproofing material, to satisfy both technical and economic requirements, should possess these properties:

1. It should in no way injure the concrete, either chemically or physically.

2. It should be preferably of a character chemically similar to that of cement.

3. It should enter the mixture in its most effective form and not rely for its waterproofing quality on chemical reactions that have to take place after it is in contact with the ingredients of the concrete.

4. It should be permanent and not subject to decomposition or decay, and therefore it should be a mineral rather than an organic compound.

5. The material should be finely divided, bulky, and preferably of a colloidal nature, so as to lubricate the mass during handling and placing and act as a void filler in the hardened concrete.

6. It should readily mix with water and adhere to the other ingredients of the concrete.

7. It should be convenient to handle and easy to proportion and incorporate in the mix.

8. It should be inexpensive, so as not to increase the cost of concrete materially.

9. It should be a staple material, produced in all parts of the country, rather than a specialty.

10. It should be obtainable wherever Portland cement is sold and used."

A few years ago the U. S. Bureau of Standards made an extensive investigation into the effectiveness of various waterproofing materials. Over 40 materials were used, including hydrated lime. The result of the investigation is reported in Technologic Paper No. 3 of the United States Bureau of Standards, and we quote a statement taken from the summary of the report. This conclusion refers to the use of hydrated lime:

"This is the most efficient medium employed, and resulted in an almost impermeable mortar at the two weeks' test. Its value is probably due to its void-filling properties, and the same results could be expected from any other finely ground, inert material, such as sand, clay, etc."

While from the standpoint of producing a watertight concrete the various substances mentioned other than hydrated lime might prove equally effective, their use as a substitute for hydrated lime proves prohibitive from the standpoint of economy when an effort is made to produce sand or clay in as finely divided particles as hydrated lime.

Our recommendations for a 1:5 mix are 8 pounds of hydrated lime per bag of cement; 1:6 mix, 10 pounds hydrated lime; 1:7 mix, 12½ pounds hydrated lime. Hydrated lime can be accurately and conveniently measured. A 6-quart pail, heaping full, holds 8 pounds; an 8-quart pail holds 10 pounds; a 10-quart pail holds 12½ pounds.

There is no question that hydrated lime improves the workability of concrete (wet or dry mix) so that it is placed more easily and more economically in the forms. It reduces the quantity of water ordinarily used to give the same consistency, and in this way greater strength is obtained with less danger of shrinkage cracks; it helps to eliminate stone pockets and voids, makes concrete more nearly watertight, and produces better finishing surfaces.

To sum up, it might be said that hydrated lime:

1. Is an excellent medium for water-tightening concrete.
2. Makes concrete more workable.
3. Reduces placing and finishing costs.
4. Secures less danger of shrinkage cracks.

5. Will increase strength of concrete if proper amount be used.
6. Helps to eliminate voids.
7. Must make a denser mix, and also on account of its nature the mix is more plastic, as hydrated lime is much finer than other ingredients of concrete (this includes water).
8. A 10 per cent addition will show about 130 per cent more adhesion in brick mortar.
9. When Portland cement is setting hydrated lime is formed, so by adding hydrated lime to cement one is only increasing the proportion in the final product. Some day the cement manufacturers will do this, that is, when it is demanded of them.
10. These mixtures are recommended in Bulletin 306 of the National Lime Association, and they cover most requirements:

"The admixture of hydrated lime to concrete shall be allowed for all classes of concrete construction when these conditions are adhered to.

"The maximum amount of hydrated lime which may be used shall conform with this table, all weights given being the amount of lime which may be added for each standard bag of Portland cement:

In a 1:1½:3 mix, 8 pounds of hydrated lime per bag of cement.
In a 1:2:4 mix, 10 pounds of hydrated lime per bag of cement.
In a 1:2½:5 mix, 12 pounds of hydrated lime per bag of cement.
In a 1:3:6 mix, 16 pounds of hydrated lime per bag of cement."

"The quantities of Portland cement, sand, and coarse aggregate shall not be altered in any way; the hydrated lime shall be used as an additional ingredient. For hand-mixed concrete, the hydrated lime and Portland cement shall be well mixed dry."

Kitchen Garden, Mount Vernon

Handbooks; Their Use and Abuse

By E. N. PIKE

A WISE man many years ago wrote: "Of making many books there is no end, and much study is a weariness of the flesh". Doubtless the book from which this is taken will be recognized. The first statement seems to refer to our subject, for apparently there is no end to the making of handbooks on every subject pertaining to the profession of architect or engineer. Perhaps the study of them may be wearisome, but their use saves brain fatigue and time. The older members of these professions well remember the days when such helps were unknown, and the younger men little realize the debt we owe to the painstaking men of other days who gathered from their notebooks much of the general information that makes some of the older "pocketbooks" so useful. It is the purpose of this article to deal especially with the handbooks in general use in structural design, and to suggest to those who must use them without technical training some of the more common errors in their use.

Many of these books have come to be recognized as authorities and are frequently referred to in specifications. When this is done, the particular edition intended should be mentioned, as details and specifications are subject to change in later editions. The handbooks published by several rolling mills and long in general use may usually be relied upon for the data pertaining to structural steel, yet in a notable instance the data regarding plate girders in a well known handbook fails to take account of the effect of rivet holes in tension flanges as required by good practice.

It is not too much to say that handbooks should not be used by anyone unable to compute for himself the data they contain. For though the data given may be used with safety, it may not be based upon the requirements of the building code. Then, again, there are certain limitations of tabular values on account of conditions of loading or unsupported length of top flange of beam or effect of eccentric leading on columns, to be considered, that make essential a knowledge of the mechanical principles involved. It is true that information regarding all of this is usually to be found in explanatory notes, but it is sometimes so widely separated from the tables with which it should be used as to escape the attention of anyone who did not know of its existence or the necessity for its use.

There is also a considerable amount of information that one acquires, usually by practice, and then finds that there is some rule that covers the case. For example, one may learn by experience that an 8-inch beam may be used up to 16 feet span, or a 10-inch beam to 20 feet, and so on; but one may not have discovered that it is a rule of general application that the span should not exceed, in feet, twice the depth of the beam in inches; and, furthermore, that within this length the deflection will be within proper limits. In this connection there is a popular misconception that a steel beam may be used for an almost unlimited span if its safe load is not exceeded, although the tables almost invariably give the limits that should be used. If convenience requires the use of a beam shallower than this, it is necessary to reduce the load below the safe tabular load, so that the deflection will not be excessive. The deflection may be found by the formula usually given with other useful formulæ in connection with the tabulated "elements" or "properties" of rolled shapes.

These formulæ are the fundamental principles upon which nearly all the designers' computations depend, and should be thoroughly mastered by anyone who is to make more than a casual use of a handbook. With the exception of the formula for deflection, which the layman had better take on faith, it will not be difficult for one with a good knowledge of elementary mathematics to understand and to make use of the principal formulæ. The ability to do this makes it possible to determine the strength of various combinations of rolled shapes for which data may not be found in any tables at hand.

It frequently happens that one who is dependent upon tables alone selects, for example, a plate girder section that seems almost ludicrous to the experienced designer, merely because it gives the bending moment required, while shear and rivet pitch are not considered. Another common mistake is the selection of unusual sizes of beams, channels or angles,—that is of sizes not likely to be readily procured from local stock. Warehouses are usually stocked with the lighter weights of beams and channels and a few of the intermediate sizes.

It is not uncommon in this connection to find that the section called for is one or two sizes heavier than is required. Of course where corrosion may be anticipated it is desirable to do this, but more often it is done "just for luck", and someone pays the penalty of inexperience.

One may find the data for designing roof trusses requiring little if any mental labor. The resulting design often raises the question of how the stresses given can be so accurate and the sections used so wide of the mark. And in such cases something seems to impel the "designer" to make a detail, lest the steel fabricator should not know how, with a result that would be laughable if the possibilities were not so serious. A recent illustration in *Engineering News-Record* shows the possibility of failure of a roof truss that may have been all right for sizes of material, if properly detailed, but which failed, apparently, from the exaggeration of a fault that is not uncommon in a truss for a pitch roof, at bearing on wall. Small details are often important.

Perhaps enough has been said to indicate the risks that are taken by inexperience, not to say ignorance. It is often said that one who will be his own lawyer has a fool for a client, and the same thing is more or less true of engineering problems. For those of us who must make more or less occasional use of handbooks and are qualified to do so intelligently, some suggestions may not be amiss. There is a remarkable amount of information, and in general very reliable information, to be found in several well known handbooks, but it should be kept in mind that these books were compiled in the interest of some particular material or type of construction, and that such data as may be given for other materials may not be entirely without suspicion of bias. For example, the tables for strength of wooden beams to be found in most steel handbooks are usually from 20 to 40 per cent under allowable values. In the case of data for various types of concrete construction, one does well to satisfy oneself that the methods of computation used are such as one can approve, or will comply with building laws.

There is so much tabulated data available that no single handbook is likely to contain all the data one can use. Of the handbooks published by rolling mills at least two are necessary to include both "Standard" and "Bethlehem" sections. There are also several books on structural design and concrete construction by well known authors, containing many useful and labor-saving tables, which should have a place in the engineer's working library. One should, therefore, be familiar with the material to be found in these books, and make use of that best suited to the problem.

In the design of steel beams, for example, there are tables of safe uniform loads for varying spans; safe loads per foot of length for varying spans; spacing of beams for given load per square foot; moments of resistance for beams; coefficients of strength; and section moduli. The first may be found in all handbooks and is perhaps the safest for occasional use, as it involves no computation except for total load. Present-day requirements of long span floor construction and minimum depth of beams often make it necessary to use Bethlehem H sections as beams. For this condition it is most convenient to find the section modulus required. As the tables giving section moduli can be much more compact than those for uniform loads, it will frequently be found a saving of time to make all computations on this basis. This simple operation is often made more involved than necessary by the use of length in inches instead of feet. For a distributed load and a fiber stress of 18,000 lbs., section modulus $= \frac{W\,L}{12{,}000}$ where L is length in feet; for 16,000 lbs., $S = \frac{W\,L}{10{,}666}$.

It is convenient sometimes to determine the strength of a beam when no tables are available. There are several approximate rules for this; one that is perhaps easy to remember is:—section modulus $= \frac{d\,w}{10}$; in which d is depth of beam in inches and w is weight of beam in pounds per foot. This formula applies to the light weights of Bethlehem beams with an error of not over 5 per cent. For example, taking an 18-inch, 49-lb. B I; $18 \times 49 \div 10 = 88.2$. Section modulus is 88.7.

In like manner a knowledge of the method by which moments of inertia are derived will enable one to perform almost all of the computations required in the design of structural steel without use of tables.

For those who make frequent use of certain tables it is frequently a saving of time to prepare one's own, bringing together such data as is most frequently required, and combining the values for both Standard and Bethlehem shapes. This is particularly useful where the requirements of the building code make it necessary to use unit stresses differing from those used in any of the available handbooks.

Old Houses on Canal, Bruges, Belgium
Photograph by Harold C. Whitehouse, Architect

Plate Description

HOUSE OF MRS. R. M. BISSELL, Farmington, Conn. Plates 39-42.—In designing this house there were borne in mind the fine old buildings still standing in Salem, Portsmouth and Newburyport, so many of which were erected during the latter half of the eighteenth century when these seacoast towns were at the height of their prosperity,—houses square and solid, three full stories high, with gracefully proportioned cornices, low hip roofs generally having decks surmounted by low balustrades, and chimneys in the side walls, and frequently having at one side a service wing which in many instances was the original homestead. The main front of this house and also the front which faces the terrace are of siding, while the ends or sides of the building are clapboarded. The roof is of copper which has weathered to various shades of blue-green, and about the living porch and the dinner porch there has been installed some old wrought iron from Mobile.

In the plan of the house there has been only slight departure from that of almost any of the older New England houses. The area, which in the earlier houses would have been devoted to carrying the wide hall through the house, has been considerably reduced in order to add to the length of the main living room, but the hall possesses the dignified stairway with open string and mahogany handrail and the Palladian window on the landing which would be found in any of the older houses. The windows are triple-hung and are 9 feet, 4 inches in height, easy access to the terrace being had when the two lower sashes are raised, as they often are in summer.

"GOODESTONE", HOUSE at Middleburg, Va. Plates 43-48.—Situated upon a large estate in the hunting country of Virginia, this house is occupied by its owners as a hunting lodge for only a small part of each year, serving for the greater part of the time as the estate's center of administration. The structure is built of a gray stone which abounds in Virginia, and that used here was quarried not far from where the house stands. Cream colored mortar has been used for laying up the walls and for slightly "buttering" the stonework. Stucco of a pale buff is used for the wall areas within the arches and about the tops of the Palladian windows of one of the facades. The roofs are of shingles, and the exterior trim, including the window blinds, the cornices and the tall columns are painted cream color.

The plan of the house is such that it involves two fronts, one facing south and commanding an extensive view toward the Blue Ridge Mountains, while at the opposite side is the front which includes the main entrance to the house. The floor plans provide for an interior which fulfills the promise made by the generous proportions of the house as seen from without. The large entrance hall, two full stories in height, contains a curving stairway, the balustrade of which is continued as a guard for the narrow gallery which extends across the hall at the second floor level. From the entrance hall several steps lead down into the living room, the walls of which are sheathed with pine which is arranged in panels and stained and slightly waxed. The trim elsewhere in the house is painted, with a stair rail of mahogany.

Cloister, Salisbury Cathedral, Salisbury, England
Photograph by Harold C. Whitehouse, Architect

EDITORIAL COMMENT

WORTHY TRADITIONS OF AMERICAN ARCHITECTURE

THE modern revival of American architecture, which of all the arts has made the greatest progress during the past 30 years, dates from the Columbian Exposition in Chicago. Previous to this epochal event in the artistic development of this country, there had been little advance made in recovering from the pernicious influence of the Victorian period, an era when all the arts sank to the lowest level of stagnant sterility; a time of decadence of taste, which in the United States was greatly influenced by the combined effects of growing materialism and the Civil War.

From the close of the War of 1812 the material prosperity of this country increased by leaps and bounds. The steady growth of the American merchant marine brought the United States into closer touch than ever before with England and France. As always, our architecture was largely influenced by contemporary work in those countries, and never more so than during the 50 years preceding the Civil War. French architecture had not recovered from the devastating effect of the French Revolution and the overthrow of Napoleon the First. England under the Germanic taste of Queen Victoria sank into a hopeless mire of mediocrity from which it was hard to emerge. The intricate ugliness of the Eastlake style, followed by the elaborate decoration of William Morris, had a disastrous effect upon architecture and design in this country. The remarkable mercantile and mechanical growth of our people left them little time for or interest in the study of the historic styles of architecture. Surrounded as they were with examples of English Georgian and French Renaissance architecture of the highest order, for three-quarters of a century design in this country was but little influenced by them. The Civil War, which shook our nation to its very foundation, destroyed the lavish, openhearted culture of the South, and left the cold, conservative civilization of the North to preserve and revive American culture and traditions.

The revival, which was slightly evidenced in 1876 at the Centennial Exposition in Philadelphia, took definite shape 17 years later at the Columbian Exposition at Chicago. Here the perishable palaces of white stucco with their formal settings of lagoons, terraces and colonnades, and their profuse adornment with elaborate sculpture and decorative detail, which showed for the first time in 70 years the direct influence of Classic and Renaissance architecture upon design in this country, opened the eyes of the American people to the beauty of refined ornament and perfect proportion, and awakened their minds to a belated appreciation of studied scale and balanced design, so important to architecture.

Thus began the great revival of American architecture. Founded as it was on a fresh interpretation and a free adaptation of architectural precedents found in England and Europe, it has made Americans appreciate the value of their own early architecture. To record and preserve the buildings of the colonies and early republic has not only awakened local interest and attention, but has also assumed national importance. Every large city or small town now has its historical and antiquarian society. Such societies as the Daughters of the American Revolution, the Colonial Dames, the Society of Colonial Wars, have done a great work in purchasing and restoring, through public and private subscription, many of the finest examples of Colonial architecture. In Salem the Peabody Museum and the Essex Institute exert great influence in the appreciation and preservation of early examples of architecture and the decorative arts. The Society for the Preservation of New England Antiquities, which was established in Boston, has done an invaluable work in purchasing and restoring a number of the best examples of early American country and city houses. Nothing can have a more permanent or beneficial effect upon the future development of American architecture and decoration than the perpetuation of the best examples of Colonial design, which derived its inspiration from the work of the great English and French architects and draftsmen of the eighteenth century.

Several years ago the Metropolitan Museum of New York established a department devoted to American decorative art. From a small beginning this branch of the Museum's activities has grown to be one of the most important. Through the munificent gift of Morris K. Jessup a new wing is being added to the Museum, which has as its court facade the front of the old United States Assay Office, built on Wall Street a hundred years ago. In this so-called American Wing of the Museum will be housed the already large collection of carefully selected examples of early American decorative art. From Washington the word now comes that a department to be devoted to American architecture may be incorporated in the new building for the National Museum. It is intended through the exhibits of this department to illustrate the growth and development of design in the United States.

Our early architecture has merit and interest that entitle it to permanent recognition. Without minimizing the great value of foreign art or lessening our admiration for it, we can perpetuate our traditions by giving examples of American architecture museum recognition when it deserves it. Recent events indicate that this favorable result is about to be achieved in many different sections of the country.

SERVICE SECTION

of THE ARCHITECTURAL FORUM

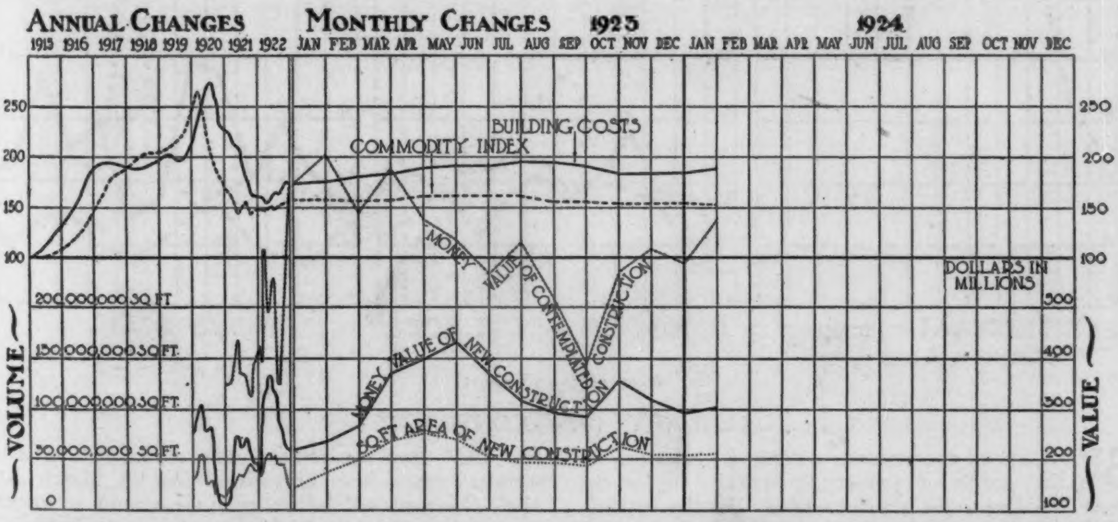
Information on economic aspects of construction and direct service for architects on subjects allied to building, through members of THE FORUM Consultation Committee

The Building Situation

THE building reports for the month of January indicate the opening of a period of unusual activity in new construction early in 1924. The total value of new contracts let in January establishes a record for that month greater than reported figures of any January in past years. As indicated on the chart below, the volume of plans filed, already high in November and December of last year, has increased materially in the month of January, indicating the probability of a continued upward trend of the line showing money value of new construction. Prices of building materials seem to have reached a point of temporary stability, but it seems obvious that a great demand will develop in the spring building season, and for this reason those who contemplate new building projects would do well to make all possible commitments at this time in order to insure delivery.

The building material manufacturing industry is in a somewhat better condition this year to absorb a heavy demand in the spring season, because production is established on a better basis and the transportation situation has improved for the delivery of raw materials and finished products. The settlement of the bituminous coal controversy insures an ample supply for manufacturers, and with the coal and rail situation on a reasonably good basis, it would seem that service to the building industry should be better than a year ago. The cost of labor, skilled and unskilled, continues at approximately the same rates in industrial plants and probably on a somewhat higher basis in the building industry. Apparently no decrease in the cost of building is to be anticipated in 1924, except as it may be influenced by seasonal conditions.

It is apparent that large sums of mortgage money will be available to finance the great volume of anticipated building construction. Reports from investment companies specializing in mortgage bonds indicate considerable interest on the part of the public and the availability of large funds. Similarly, in banking and insurance circles the supply of mortgage money would appear to be ample, and as the cost of building has become fairly well stabilized at high levels, there is some tendency toward somewhat more liberal appraisals than in previous years.

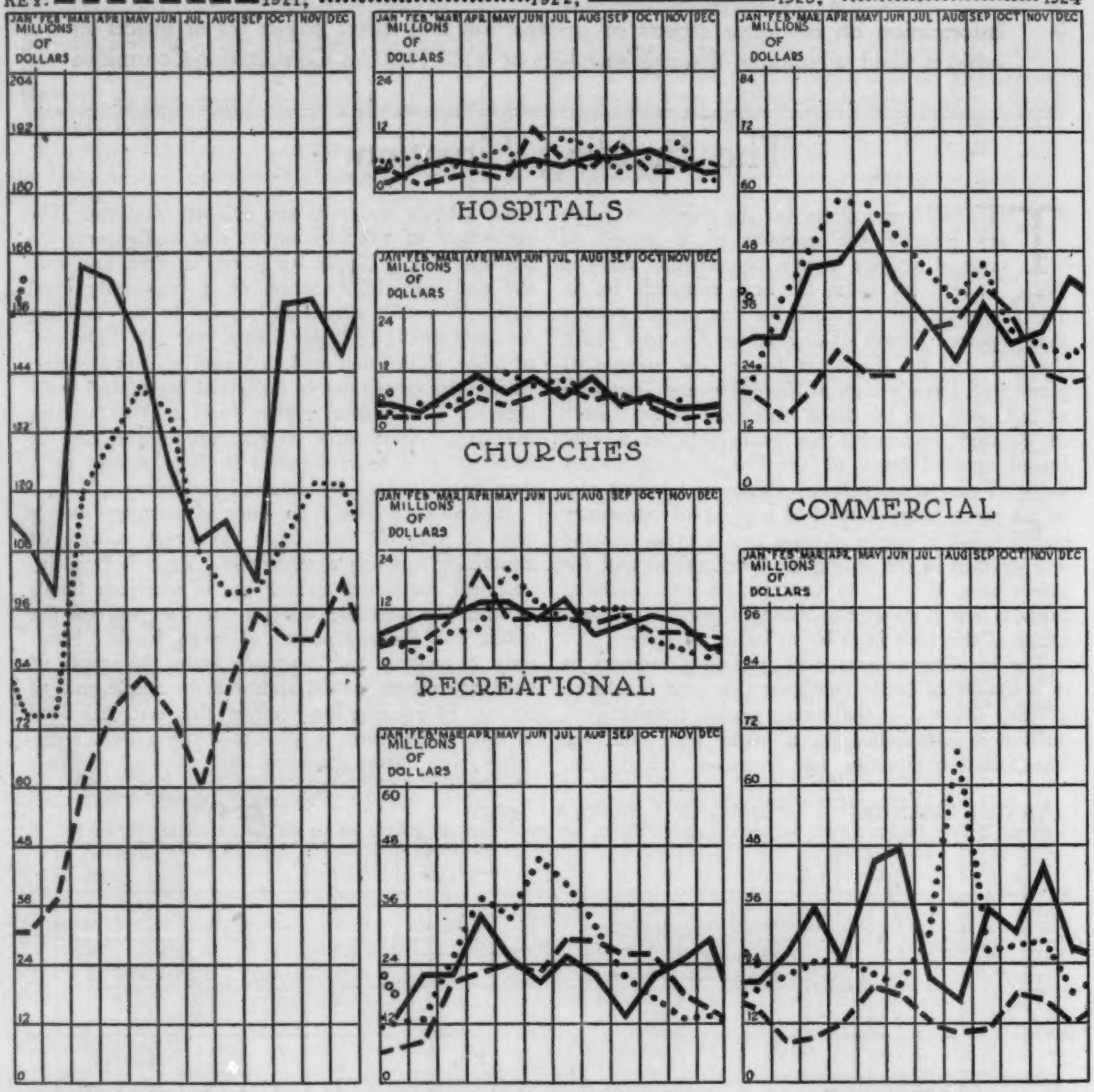


THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Co., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the right of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the left of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined first, by the trend of building costs, and second, by the quality of construction.

Monthly Analysis of the Trend of Building Activity

A study of the value of contracts let each month in seven important types of buildings — with graphic comparisons for the three preceding years

KEY: — — — — 1921; ········ 1922; ——— 1923; ∘∘∘∘∘∘∘∘ 1924



RESIDENTIAL—Including Hotels & Apts. SCHOOLS & COLLEGES INDUSTRIAL

(Key at top of chart)

JANUARY 1924 CONTRACTS

BECAUSE of the unusual volume of contracts let in the month of January, practically all of the above building types are influenced. In the residential field, which includes also hotels and apartments, it will be seen that January has opened with a total of contracts let considerably higher than in January of the previous three years. All of these types except recreational buildings show some increase for January over the same month in previous years. Unless the year 1924 shows an unusual reversal as compared to previous years, it is anticipated that in March and April all records will be broken in the amount of money expended for residential construction. A factor of added interest, although impossible to record, is that great activity is anticipated in the remodeling of old buildings, particularly in the moderate cost dwelling field, and the making over of old city houses into small or medium sized apartments to secure better returns.

BUILDING MATERIAL PRICES

Table Showing Average Prices Paid by Contractors for Building Materials at Local Distributing Points as of February 1, 1924. Prepared by Division of Building and Housing of the Bureau of Standards from Prices Secured through the Bureau of Census

Commodities	Size or Condition	Unit	Fitchburg	Haverhill	New London	Pittsburgh	Erie	Baltimore	Richmond	Fairmont	Columbia	Savannah	Detroit	Flint	Bay City	Saginaw	Shreveport	Grand Forks	Sioux Falls	San Antonio
Common Brick		1,000	24.00	28.00	27.00	17.00	17.75	20.00	19.00	26.00	12.00	14.00	17.50	16.00	18.00	15.00	15.00	15.00	18.00	17.00
Portland Cement	Excl. of containers	Bbl.	3.25	3.60	3.60	2.85	3.40	3.10	3.50	2.85	3.50	3.00	3.40	2.75	2.75	3.25	3.20	3.20	3.00	....
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	52.00	48.00	40.00	32.00	....	....	30.00	40.00	45.00	50.00	55.00	47.00	....	....	50.00
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	47.00	47.00	....
N. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	....	48.00	....	....	51.00	25.00	....	....	....	....	....	....	....	....	....
Common Boards No. 1	1x6	M	55.00	52.00	45.00	50.00	47.00	42.50	32.00	50.00	25.00	30.00	40.00	42.00	42.00	....	32.00	43.00	47.00	52.50
Y.P. Flooring Edge Grain "C"	1x4-10′-16′	M	....	128.00	....	....	....	135.00	....	100.00	95.00	....	....	80.00	80.00	100.00	105.00	....	....	105.00
Douglas Fir V. G. No. 2	1x4-10′-16′	M	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	85.00	85.00	....
Red Cedar Shingles	Extra clear 16″ 5 to 2	M	....	6.20	6.00	6.25	6.75	11.20	7.20	7.25	....	....	5.50	6.00	6.00	6.50	5.85	5.40	5.25	....
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6.30	....	....	7.50
Composition Shingles	Crushed slate surfaced	100 sq. ft.	....	....	....	6.50	6.25	....	5.48	6.25	6.25	6.25	6.00	6.25	6.25	6.50	6.90	....	7.50	9.00
Gypsum Plaster Board	½″	1,000 sq. ft.	....	45.00	50.00	37.50	45.00	....	40.00	32.00	35.00	....	30.00	45.00	40.00	45.00	45.00	....	32.00	47.50
Lime	Hyd. Com.	Ton	25.00	20.00	26.00	23.00	22.00	....	17.50	18.00	17.50	17.50	18.00	20.00	18.50	18.00	25.00	23.00	24.00	20.00
Building Sand		Cu. yd.	1.80	2.50	1.65	2.50	2.50	2.00	2.25	3.75	1.25	....	2.75	....	2.25	2.75	2.25	2.70	1.25	2.37
Crushed Stone	¾″	Ton	3.25	2.50	....	5.50	3.50	....	....	3.00	2.75	4.40	2.35	....	2.50	3.50	3.20	....	1.85	2.75
Wire Nails		Keg	4.10	4.90	5.05	3.50	3.50	3.50	4.05	4.00	4.25	3.95	4.25	3.75	3.80	3.65	4.60	5.50	....	6.30
Window Glass	Single A 10″x12″	50 sq. ft.	4.80	....	4.27	....	....	4.80	5.80	5.25	....	....	3.90	4.25	4.75	....	5.10	....	6.00	....
Hollow Tile	8″x12″x12″	Each	.30	.30	.32	.19	.21	.20	.20	.24	.17	....	.20	....	.17	.24	.22	....	.19	.21
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	....	....	....	....	....	....	....	88.00	....	....	....	....	85.00	78.46	106.25	96.92	....	129.36
Steel Pipe	1″ galv.	100 ft.	....	....	....	9.86	....	9.88	10.00	10.00	11.87	9.46	....	....	10.00	10.00	11.95	....	....	12.36
Reinforcement Bars	¾″ square	100 lbs.	4.00	....	....	3.50	....	3.60	3.35	3.50	4.60	5.00	3.50	....	3.50	....	4.00	....	....	4.00
Structural Steel	Fab. 6″ I-beams	100 lbs.	....	....	....	3.25	....	3.75	4.50	6.00	5.00	5.00	6.00	....	4.80	5.00	6.50	....	....	4.50
White Lead	Dry	100 lbs.	....	14.00	14.50	14.50	....	14.25	15.00	14.00	15.00	14.75	....	14.00	14.00	12.25	15.25	16.00	....	15.75
Zinc Oxide	Am. process lead free	100 lbs.	....	....	....	15.00	....	....	....	....	22.50	20.00	....	....	....	16.00	....	....	....	16.00
Gypsum Plaster	Neat	Ton	24.00	....	26.00	22.00	24.00	19.00	19.50	19.00	19.00	21.50	21.00	17.00	17.00	16.00	24.00	23.00	14.50	24.00
Linseed Oil	Raw in bbls.	Gal.	....	1.05	1.35	.95	....	1.00	1.12	1.30	1.25	1.05	....	....	1.10	.85	1.55	1.50	....	1.10
Roofing Slate	No. 1 ribbon	100 sq. ft.	....	....	....	13.50	....	....	13.50	12.50	....	....	....	....	17.50	....	12.00	....	....	17.60
Tar Paper, Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	....	2.75	....	1.95	....	....	....	....	....	1.95	2.25	2.75	2.75	2.80	2.75	....	3.75	3.50
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	....	1.60	....	1.35	1.40	1.25	1.50	1.25	....	....	1.40	1.50	1.20	2.10	1.40	1.80	1.50	1.80

Commodities	Size or Condition	Unit	Poughkeepsie	Syracuse	Rochester	Buffalo	Cleveland	Akron	Lorain	Dayton	Waterloo	Des Moines	Council Bluffs	Spokane	Seattle	Portland Oreg.	Milwaukee	Tucson	Los Angeles	Newark
Common Brick		1,000	20.00	20.00	17.75	23.00	16.00	16.00	20.00	18.00	16.50	19.00	16.50	....	15.00	20.00	13.50	15.00	15.50	18.00
Portland Cement	Excl. of containers	Bbl.	2.90	3.30	3.35	3.03	3.40	3.20	3.40	3.60	2.90	3.10	2.90	2.98	3.40	3.55	2.45	3.60	3.36	3.35
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	60.00	....	55.00	58.00	45.00	55.00	57.50	52.00	52.00	50.00	....	....	....	40.00	....	....	50.00
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	45.00	....	56.00	60.00	....	....	....	....	52.00	52.00	48.00	30.00	24.00	24.50	....	62.00	41.50	....
N. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	42.00	48.00	....	....	....	....	52.50	....	....	....	....	....	....	....	....	....	....
Common Boards No. 1	1x6	M	38.00	39.00	45.00	50.00	48.00	45.00	50.00	....	47.00	54.00	48.00	29.00	23.00	24.50	42.00	57.00	40.00	47.50
Y.P. Flooring Edge Grain "C"	1x4-10′-16′	M	130.00	105.00	130.00	....	90.00	....	105.00	....	98.00	106.00	110.00	....	....	....	....	....	....	95.00
Douglas Fir V. G. No. 2	1x4-10′-16′	M	....	90.00	....	115.00	....	....	....	90.00	98.00	95.00	98.00	80.00	62.50	58.00	....	95.00	82.75	....
Red Cedar Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	6.25	6.00	6.75	6.00	6.00	6.50	6.20	6.50	6.50	6.25	....	3.75	....	5.75	5.50	4.06	6.50
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	....	6.00	....	....	6.25	....	....	6.50	7.50	6.00	....	....	....	....	6.50	....	....	6.50
Gypsum Plaster Board	½″	1,000 sq. ft.	50.00	32.50	30.00	45.00	32.00	26.00	....	....	36.00	40.00	35.00	....	35.00	40.00	40.00	50.00	35.00	....
Lime	Hyd. Com.	Ton	22.00	20.00	20.00	16.00	20.00	20.00	18.00	15.20	20.00	20.00	21.00	20.00	24.00	26.00	16.00	30.00	26.50	17.50
Building Sand		Cu. yd.	2.50	1.80	2.25	1.48	2.50	2.50	2.50	2.00	1.50	2.00	3.50	....	1.85	2.00	1.75	1.25	1.75	2.50
Crushed Stone	¾″	Ton	3.00	2.25	2.25	1.30	3.50	3.25	2.65	2.00	3.00	4.30	4.00	....	....	....	2.67	3.00	3.10	....
Wire Nails		Keg	5.05	4.00	4.25	4.25	3.60	3.80	3.15	3.90	4.50	4.25	....	4.85	4.35	4.50	3.80	6.00	4.25	3.80
Window Glass	Single A 10″x12″	50 sq. ft.	....	4.50	4.20	4.20	....	4.50	....	4.50	5.25	4.75	....	4.43	....	5.00	5.25	....	4.38	4.00
Hollow Tile	8″x12″x12″	Each	.21	.25	.18	.20	....	.17	.19	.21	.17	....	....	.20	.20	.20	.17	.18	.20	.18
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	....	80.00	79.23	63.05	73.46	70.15	....	72.00	82.00	90.00	....	88.00	95.00	113.00	....	....	75.19	....
Steel Pipe	1″ galv.	100 ft.	....	10.51	10.52	10.51	10.90	10.36	....	10.57	12.00	11.00	....	11.50	11.85	....	9.75	....	11.30	10.40
Reinforcement Bars	¾″ square	100 lbs.	4.50	4.00	3.70	2.75	3.35	3.90	3.65	....	4.00	3.50	3.25	4.40	4.00	4.00	3.60	4.50	4.25	....
Structural Steel	Fab. 6″ I-beams	100 lbs.	5.00	....	4.70	3.65	3.46	3.50	....	....	4.95	5.25	....	....	5.75	5.50	6.00	....	6.00	....
White Lead	Dry	100 lbs.	....	14.25	13.00	14.25	14.25	14.50	....	14.50	14.50	14.50	15.50	14.50	13.50	....	....	15.00	13.50	13.50
Zinc Oxide	Am. process lead free	100 lbs.	....	....	....	....	....	....	....	15.00	14.75	14.75	....	14.00	....	....	....	....	13.00	....
Gypsum Plaster	Neat	Ton	21.00	19.25	18.00	17.00	....	19.00	17.20	18.00	18.00	18.00	17.00	20.00	21.00	21.00	....	20.00	17.80	19.00
Linseed Oil	Raw in bbls.	Gal.	....	1.05	1.33	1.06	1.02	1.00	....	1.20	1.30	1.20	....	1.04	1.08	1.25	1.04	....	1.04	1.00
Roofing Slate	No. 1 ribbon	100 sq. ft.	....	14.00	15.00	....	....	13.50	....	15.00	18.00	18.00	....	....	....	....	17.50	....	....	13.50
Tar Paper, Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	....	2.25	2.50	2.00	2.50	2.75	....	1.80	3.25	2.75	....	3.10	....	....	2.45	3.50	3.75	2.25
Rosin Sized Sheathing	3 ply 30 lbs. per roll of	500 sq. ft.	....	1.50	1.25	1.50	.90	.85	....	....	1.40	1.40	1.40	1.41	1.50	1.80	1.15	1.75	1.50	1.20

THE FORUM CONSULTATION COMMITTEE

A group of nationally known experts on various technical subjects allied to building, providing a direct service to architects

THE editors of THE ARCHITECTURAL FORUM have been fortunate in obtaining the co-operation of the following recognized experts who constitute THE FORUM Consultation Committee. This Committee provides a service of the greatest value to subscribers in addition to the usual editorial service and architects who seek information on specific questions in these various fields are invited to present inquiries.

The basis on which this Committee has been organized is:

(*a*) That each committee member shall be a representative leader in his line;

(*b*) That no committee member has affiliations with any manufacturer;

(*c*) That no committee member will be called upon for detailed service excepting by special arrangement;

(*d*) That a special editorial article on a subject represented under each of the headings below shall be prepared during the year by the committee member.

SUBJECTS AND COMMITTEE PERSONNEL

HOTEL DESIGN AND EQUIPMENT

DANIEL P. RITCHEY

Known in the hotel field as the "hotel doctor," Mr. Ritchey, who is an engineer as well as an experienced hotel owner and manager, is qualified to answer any questions which may arise in this connection.

HEATING AND VENTILATING

CHARLES A. FULLER

Consulting, Heating and Ventilating Engineer

Member of firm of Griggs & Myers, New York. Widely experienced in the field of heating and ventilating design for office buildings, institutions and industrials; specialist on investigation and report work on mechanical equipment for new and old plants.

ELECTRICAL SCIENCE

WILLIAM L. GOODWIN

Vice-president of the Society for Electrical Development

This Society is organized to promote accurate knowledge of the practical application of electricity. Its activities extend from the simple problems of household equipment to highly developed electrical plants. Particular attention is given the development of provision for electrical service in buildings.

SAFETY ENGINEERING

S. J. WILLIAMS

Secretary and Chief Engineer, National Safety Council, Chicago

Safety engineering is an important factor in the design of buildings where large groups of people congregate. The National Safety Council has investigated construction and devices with the greatest minuteness.

FARM SCIENCE

FREDERICK WALTER IVES, B.S., M.E.

Professor and head of Department of Agricultural Engineering, Ohio State University. Consulting Agricultural Engineer, Columbus, Ohio.

Specialist in land drainage, soil improvement, surveys, farm arrangement for economical production, purchase of equipment and economical layout of farm buildings with special reference to interior arrangement.

FINANCE

WALTER STABLER

Comptroller, Metropolitan Life Insurance Co.

The largest institution in the United States making loans for building construction. Mr. Stabler's knowledge of building investments covers the country and is widely recognized.

REAL ESTATE

C. STANLEY TAYLOR

Widely experienced in real estate development and financing, real property law, architecture, engineering and building construction. Financial and Business Editor of THE ARCHITECTURAL FORUM.

FIRE PROTECTION ENGINEERING

J. D. HUNTER

Chief Engineer, Marsh & McLennan, Insurance Brokers, New York

Specialist in insurance engineering as applied to building design, construction and equipment.

BUILDING MANAGEMENT

J. CLYDESDALE CUSHMAN

President, Cushman & Wakefield, Inc., Real Estate, New York

Mr. Cushman's firm has participated largely in the promotion and operation of many large New York buildings. His specialty is the management of office buildings.

GAS SERVICE AND UTILIZATION

NILS T. SELLMAN

Service Engineer, American Gas Association

A specialist in problems pertaining to gas service and its use in all classes of buildings and industries.

Address inquiries to committee members, care THE ARCHITECTURAL FORUM, 383 Madison Avenue, New York

THE FORUM DIGEST

A SURVEY OF IMPORTANT CURRENT ARTICLES ON BUILDING ECONOMICS AND BUSINESS CONDITIONS AFFECTING CONSTRUCTION

The Editors of this Department select from a wide range of publications matter of definite interest to Architects which would otherwise be available only through laborious effort

Air Leakage Through Window Openings

By F. C. HOUGHTEN *and* C. C. SCHRADER, *Pittsburgh, Pa.*

Reports of Coöperative Work by A. S. H. & V. E. Laboratory and the U. S. Bureau of Mines Experiment Station

HEAT is lost from buildings in two ways: *First,* by transmission and *Second,* by infiltration. Both sources of heat loss are of vital concern to the heating and ventilating engineer, the architect and the owner. Both are difficult of exact measurement and determination of constants which may be used in practice with the desired engineering accuracy. As a result, the calculation of heat loss from buildings probably involves a greater element of chance than any other engineering problem.

The great need for information regarding infiltration led to an investigation of the leakage of air through and around all types of windows and doors by the Research Laboratory of the American Society of Heating and Ventilating Engineers, in coöperation with the American Institute of Architects and the U. S. Bureau of Mines, according to the *Journal of the American Society of Heating and Ventilating Engineers.* The architect is interested in the relative leakage of air through various types of windows and doors, with and without weatherstripping.

This report deals with the method employed in the investigation of and results obtained for double-hung windows, 2 ft. 8 in. x 5 ft. 2 in. x 1⅜ in., in a 13-in. brick wall, plastered on the inside with cement plaster. Results are given for the leakage, through such a window without weatherstripping, with two types of weatherstripping around the frame, and through the brick wall itself.

Leakage of air through cracks around windows and doors, cracks in walls, and through the porous materials of which walls are made, takes place in accordance with two physical laws. *First,* there is an interchange of air through the wall by diffusion; *Second,* there may be a current of air through the wall caused by a pressure difference set up by the impinging wind. The first goes on at all times, is independent of wind velocity, and is probably negligible. The second takes place only when there is a pressure difference between the two sides of the wall. Such a pressure difference exists whenever the wind blows against the surface of the wall or whenever the direction of the wind toward the wall is changed. For any given velocity of wind striking the wall at right angles, there is always

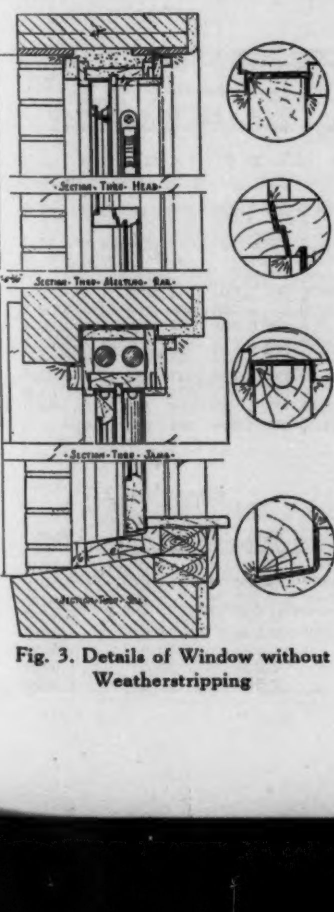


Fig. 3. Details of Window without Weatherstripping

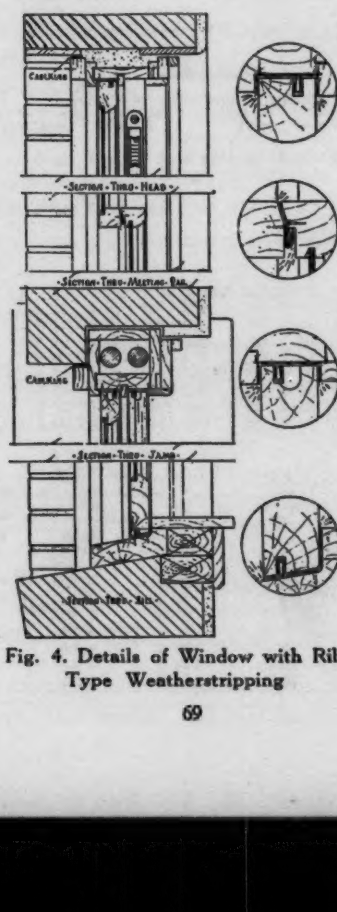


Fig. 4. Details of Window with Rib Type Weatherstripping

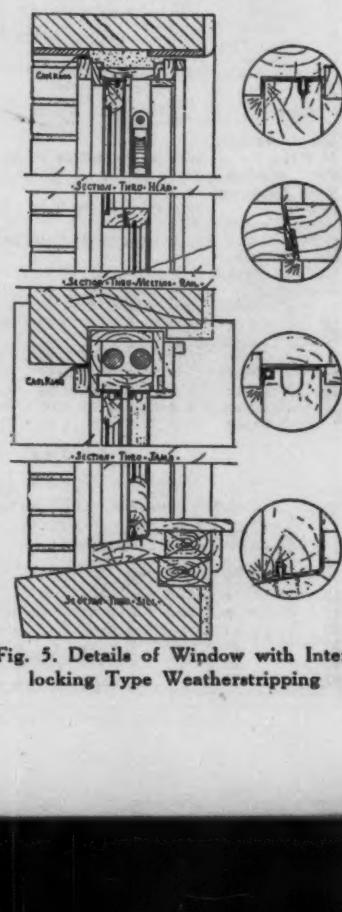


Fig. 5. Details of Window with Interlocking Type Weatherstripping

a definite pressure produced at the surface which tends to cause leakage of air through cracks. The amount of air leakage for any crack for a given pressure difference is the same regardless of whether this pressure is produced by wind or other cause.

Uniform air velocities over a large area for a long period of time are hard to produce and difficult to duplicate. It is much easier to produce and duplicate pressure differences on the two sides of a window by means of a blower. It was, therefore, decided that for this investigation the apparatus should be so designed that a blower could be used to produce a pressure drop through the test window built in a section of wall.

Preliminary Tests

Preliminary tests were made in order to study the working of the apparatus itself and in order to differentiate between the various channels of leakage through the window and wall. Leakage through the window may be divided into the following parts: *First,* that which passes through the cracks, around the sash perimeter which are subject to weatherstrip application; *Second,* that which passes through the cracks between the frame and the brick and can be eliminated by calking under the staff bead or brick mold. This may be called the frame leakage. *Third,* leakage through other cracks in the frame or sash which cannot be eliminated by either weatherstripping or calking and may be called the "elsewhere" leakage.

Before making the first series of tests, the joint between the brick and the chamber wall was calked so that all leakage would take place through the wall or window. In all other respects, the wall and window were in the condition in which they were left by the mechanics, the sash having been fitted as tight as would allow free sliding, though probably tighter than would be allowable in actual construction because of swelling in rainy or damp weather. The window was left unlocked. A large number of tests were made with various pressure drops through the wall, many of them being duplicated several times after opening and closing the window, in order to determine the variation due to the way in which the window was closed. No care was taken to close the window in any particular way other than to see that the lower sash was pushed down against the sill and the upper sash raised until the meeting rails were even. Curve 1, Fig. 6, shows the leakage for this condition for various pressures or wind velocities. The shape of the curve is characteristic of all curves obtained with the various conditions of the window and, as would be expected, shows the same characteristics as the curve for the flow of air through an orifice. For a pressure difference of 0.1 in. of water through the wall corresponding to a wind velocity against the wall of 14.4 miles per hr., 42 cu. ft. of air per min. passed through the window and wall. With a pressure drop through the wall of 1 in. of water, corresponding to a 45.5-mile wind velocity, 174 cu. ft. per min. passed through.

The second series of tests was made under the same conditions as the first series, excepting that the window was locked. Curve 2 shows the leakage for various wind velocities for the locked window. Locking caused a reduction in leakage of 20 cu. ft. per min. with a 14.4-mile wind and 64 cu. ft. per min. with a 45.5-mile wind. The third series of tests was made with the cracks around the sash perimeter, which are subject to weatherstrip application, sealed with a rubberized adhesive tape. This tape was tested and found to be as effective as a plastic calking compound and was more easily and quickly applied and removed. The leakage for this series of tests is given in Curve 3, and the difference between this curve and Curve 1 or 2 indicates the maximum possible reduction in leakage by a perfect weatherstrip.

Before making the next series of tests the staff bead or brick mold was removed and the crack between the frame and the brick wall calked. The brick mold was then replaced. Calking was also applied between the frame sill and the brick. The leakage for this condition is given in Curve 4 and the difference between Curve 4 and Curve 3 gives the leakage between the frame and the wall, commonly called the frame leakage.

In order to determine the elsewhere leakage, a sheet of galvanized iron was fastened by screws over the entire frame and the edges were sealed with calking compound. The leakage for this condition is given in Curve 5. The difference between Curve 4 and Curve 5 is the leakage stopped by the galvanized iron and is the elsewhere leakage.

Curve 5 shows a considerable leakage which does not go through the window opening, but through the

Table 1. Data on Tests of Windows under Various Conditions

	Leakage C.F.M. Crack Perimeter 18′ 4″				B.t.u. per Hour 0–70°Fahr.				B.t.u. per Hour 20–70°Fahr.				Radiation on Sq. Ft. 240 B.t.u. per Sq. Ft. per Hour 0–70°Fahr.				Lb. of Coal Based on 13,000 B.t.u. and 50% Efficiency at Radiator 35°–70°Fahr. for Seven Months			
	For total window		Per ft. crack		For total window		Per ft. crack		For total window		Per ft. crack		For total window		Per ft. crack		For total window		Per ft. crack	
Wind velocity, M.P.H.	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9	14.4	24.9
Plain window—very tight—unlocked	19.0	40.0	1.04	2.18	1445	3040	78.7	166.0	1033	2170	56.3	118.5	6.02	12.67	0.328	0.692	560	1180	30.50	64.3
Plain Window—tight—unlocked	22.0	46.0	1.20	2.53	1673	3500	91.3	192.5	1195	2500	65.2	137.5	6.97	14.60	0.381	0.802	648	1357	35.40	74.5
Plain window—1/16″ to 1/4″ crack—unlocked	46.0	75.0	2.53	4.08	3500	5700	192.5	310.0	2500	4075	137.5	222.0	14.6	23.80	0.802	1.290	1357	2213	7.45	120.5
Rib Strip 1/16″ Crack	9.0	20.0	0.49	1.09	685	1522	37.3	83.0	488	1087	26.6	59.2	2.86	6.34	0.155	0.346	266	590	14.45	32.2
Rib Strip 1/8″ Crack	11.0	22.5	0.60	1.25	837	1710	45.6	95.1	598	1223	32.6	67.9	3.48	7.12	0.190	0.396	324	663	17.70	36.9
Rib Strip 3/16″ Crack	15.0	30.0	0.82	1.63	1141	2282	62.2	124.4	815	1630	44.4	88.8	4.75	9.50	0.259	0.518	442	884	24.10	48.5
Rib Strip 1/4″ Crack	18.0	36.0	0.98	1.96	1370	2740	74.7	149.4	978	1956	53.3	106.6	5.71	11.42	0.311	0.622	531	1062	28.95	57.9
Interlocking Strip 1/16″ Crack	7.0	16.0	0.38	0.87	533	1218	29.0	66.3	380	870	20.7	47.3	2.22	5.07	0.121	0.276	207	472	11.23	25.7
Interlocking Strip 1/8″ Crack	8.5	18.0	0.46	0.98	647	1370	35.3	74.7	462	978	25.2	53.3	2.69	5.71	0.147	0.311	251	531	13.66	29.0
Interlocking Strip 3/16″ Crack	9.0	19.5	0.49	1.06	685	1483	37.3	80.9	489	1060	26.6	57.8	2.85	6.18	0.155	0.337	266	575	14.45	31.4
Interlocking Strip 1/4″ Crack	10.0	20.5	0.55	1.12	761	1560	41.4	85.0	543	1114	29.6	60.7	3.17	6.50	0.173	0.354	295	605	16.08	32.9

Table 2. Leakage in C.F.M.

Wind Velocity M.P.H.	Frame 17 Ft. Perimeter		Wall per Sq. Ft.	Elsewhere	Window with 1/16 In. Crack, Perimeter 18 Ft. 4 In. — Plain		Rib strip		Interlocking Strip	
	For total window	Per ft. crack			For total window	Per ft. crack	For total window	Per ft. crack	For total window	Per ft. crack
5	0.50	0.0294	0.0111	0.7	15.0	0.818	1.3	0.071	1.0	0.0546
7.5	2.3	0.1325	0.0289	1.8	24.0	1.31	3.0	0.164	2.2	0.1200
10	4.0	0.2350	0.0512	2.8	32.5	1.77	5.0	0.273	4.0	0.2180
15	8.0	0.4710	0.1110	5.2	47.5	2.59	9.7	0.529	7.8	0.4260
20	11.0	0.6470	0.1780	7.6	61.5	3.36	14.8	0.808	11.8	0.6440
30	19.0	1.1180	0.3330	13.6	89.0	4.86	25.5	1.390	20.0	1.0920
40	25.5	1.5000	0.5250	20.0	118.0	6.44	37.0	2.020	30.0	1.6380
50	31.5	1.8530	0.7150	26.0	149.0	8.13	48.5	2.650	41.0	2.2400

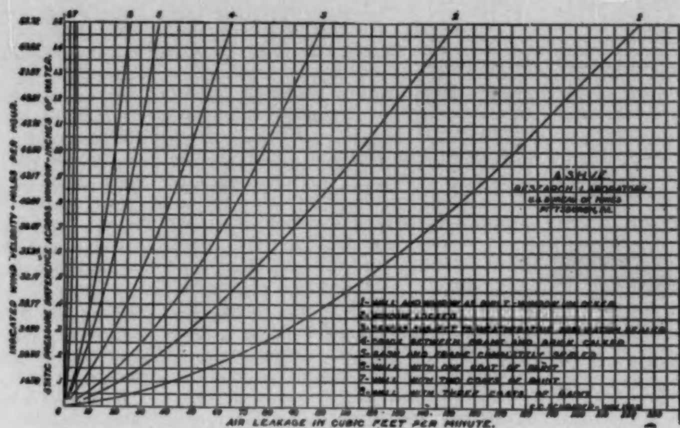


Fig. 6. Results of Tests of Leakage Through Various Parts of Window and Wall

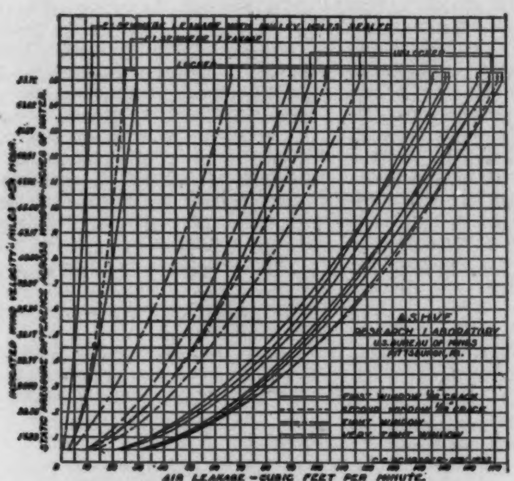


Fig. 7. Results of Tests on Windows with Various Cracks, Showing Variation in Leakage for Different Tests on Same Window

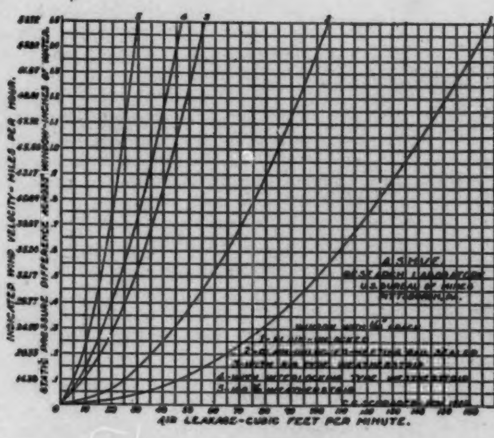


Fig. 8. Results of Tests on Windows with 1/16" Crack Around Perimeter

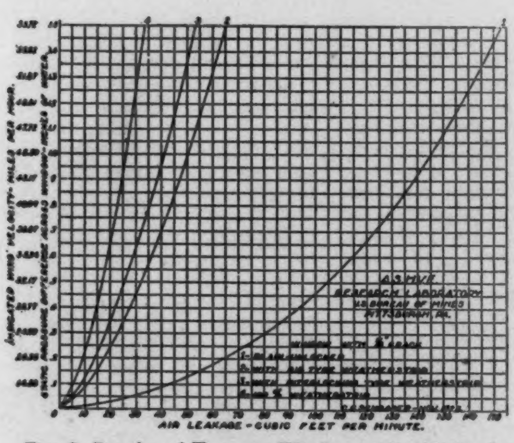


Fig. 9. Results of Tests on Window with ⅛" Crack Around Perimeter

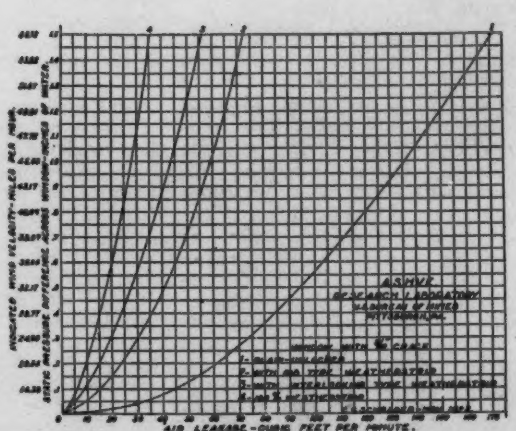


Fig. 10. Results of Tests on Window with 3/16" Crack Around Perimeter

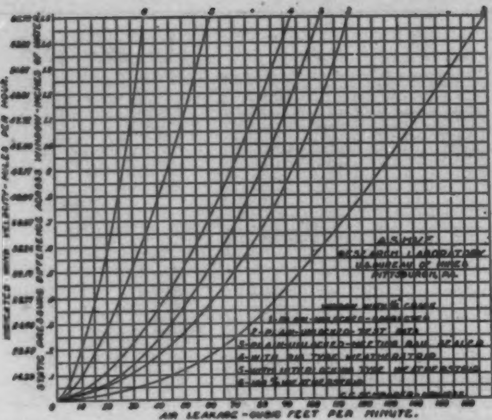


Fig. 11. Window with ¼" Crack Around Perimeter

brick wall and the plaster. To prove that this leakage was really through the brick wall, the wall was painted with one coat of asphaltum paint and another series of tests made. The result of this series is shown in Curve 6. The difference between Curves 5 and 6 represents the leakage stopped by one coat of paint. The wall was then thoroughly inspected and any visible cracks in the mortar closed with calking compound and given second and third coats of paint after each of which additional series of tests were made resulting in Curves 7 and 8, respectively. These curves show the reduction in leakage through the wall by each coat of paint. Another coat of paint was applied later and the leakage through the wall was further reduced to one-half of that shown in Curve 8. The total leakage through the entire wall had been reduced by the various processes from 4.5 cu. ft. per min. to 0.2 cu. ft. per min. for a 14.4-mile wind, and from 28 cu. ft. per min. to 0.9 cu. ft. per min. for a 45.4-mile wind. No doubt further painting would have reduced the leakage still more, but that shown by Curve 8 was so small that it was considered negligible.

Tests on Windows with and without Weatherstripping

In these tests the sash were often changed and at least two different sash were fitted and tested for each condition. Figs. 4 and 5 show vertical sections of the window with the two types of weatherstripping together with horizontal sections through one side of the sash and frame, and also detailed sections of the various weatherstripped cracks.

The curves in Fig. 7 show the variation in data obtained for different windows fitted in the same way, for the same sash removed and replaced several times; also the leakage for tight windows and the effect of sealing the pulley holes. The five curves for the unlocked window with ⅟₁₆-in. crack show the variation which can be obtained for the same window under different conditions and for a second window fitted as nearly the same as could be done by a carpenter. The greatest variation from the mean of the five series of tests is about 4 per cent. The variation in the leakage of the same window locked shows the effect that locking may have. The main effect of locking is on the leakage through the meeting rail crack. The lock on the sash giving the three solid line curves was put on by the carpenter in the usual manner. The lock on the sash giving the curve with the short dashes was put on by a member of the laboratory staff in such a manner as to draw the meeting rails together as tightly as possible The locks on the weatherstripped windows were put on by the carpenter. Locking caused no reduction in leakage for these windows. The tight window was fitted so as to allow opening without great difficulty. The very tight window required considerable effort in opening.

Figs. 8 to 11 give the results for the various sized cracks without weatherstripping, with two types of weatherstripping, and with 100 per cent weatherstripping, that is, with the cracks subject to weatherstrip application sealed up, thus allowing only the "elsewhere" leakage. In each case the curve given is the average of several tests.

Tables 1 and 2 contain data taken from the curves Figs. 6 to 11 or resulting therefrom. Table 1 gives the leakage in cubic feet per minute for the whole window and per linear foot to crack for wind velocities of 14.4 and 24.9 miles per hour. It is of interest to note that for a plain window with crack varying from ⅟₁₆ to ¼ in. the leakage is 46 cu. ft. per min., while for the two types of weatherstripping tested it varies from 9 to 18 and 7 to 10 cu. ft. per min. respectively. The heat loss is given for two temperature differences. The heat loss for any temperature difference varies directly as the leakage. The radiation required to supply this heat loss is given for the higher temperature difference only, since it must be supplied for the maximum condition. With a 14.4-mile wind based upon the above temperature difference the unweatherstripped windows with cracks varying from ⅟₁₆ to ¼ in. required 14.6 sq. ft. of radiation, while the same windows with the two types of weatherstripping require only from 2.8 to 5.7 and 2.2 and 3.2 sq. ft. respectively. Basing cost of radiation on $2 per sq. ft. installed, the two types of weatherstripping will show a resulting decrease in first cost of radiation of about $18 and $23 per window respectively. The further saving in coal per year based upon a seven-month heating season with an average temperature difference of 35° is also given.

Table 2 gives the "elsewhere," wall, and frame leakage, and also the leakage through with the window with and without weatherstripping for various wind velocities.

Perhaps the most surprising fact brought out by this table, if not by the whole investigation, is the leakage per square foot of wall. With a 15-mile wind each square foot of the 13-in. wall, plastered on the inside, allowed the passage of 0.111 cu. ft. of air per min., while the leakage through the window and frame for the same wind velocity was 47.5, 9.7 and 7.8 cu. ft. per min. for the plain window and two types of weatherstripping respectively. The area of the window and frame is 16.25 sq. ft. giving a leakage of 2.82, 0.597 and 0.48 cu. ft. per min. per sq. ft. of window without and with the two types of weatherstripping. Based upon these figures, the leakage through the window and frame varies from 4 to 28 times that through the same area of wall. When we take into consideration the usual greater area of wall to window, it is evident that the leakage into a room is usually greater through the wall than through the window if weatherstripped, and not many times less if not weatherstripped. It is of interest to compare the heat loss through windows and walls by transmission and by leakage. The leakage for the plain window and with two types of weatherstripping all for ⅟₁₆-in. crack and a 15-mile wind is 47.5, 9.7 and 7.8 cu. ft. per min. respectively, representing a heat loss of 2580, 527 and 423 B.t.u. per hr. respectively for a 50° temperature difference. A leakage of 0.111 cu. ft. per min. per sq. ft. of wall represents a heat loss of 6.03 B.t.u. per hr. for a 50° temperature difference. Taking the transmission through the wall as 0.28 B.t.u. per hr. per sq. ft. per degree temperature difference, this loss is 14 B.t.u. per hr. for the same temperature difference. The heat loss as thus indicated by infiltration is 43 per cent as great as the heat loss by transmission as indicated by the constant used.

The values given in the table are from the tests as made and are probably somewhat higher than those actually found in practice. They represent the leakage when the pressure drop through the window is a certain value which represents a definite wind velocity at right angles to the window. If the wind strikes the window at an oblique angle, the component of the velocity at right angles to the window must be considered. Pressure difference between the outside and the inside surfaces of the window for an actual wind will be slightly less for a given velocity because of a building up of pressure within the room before the air leaks out the opposiet side of the building.